
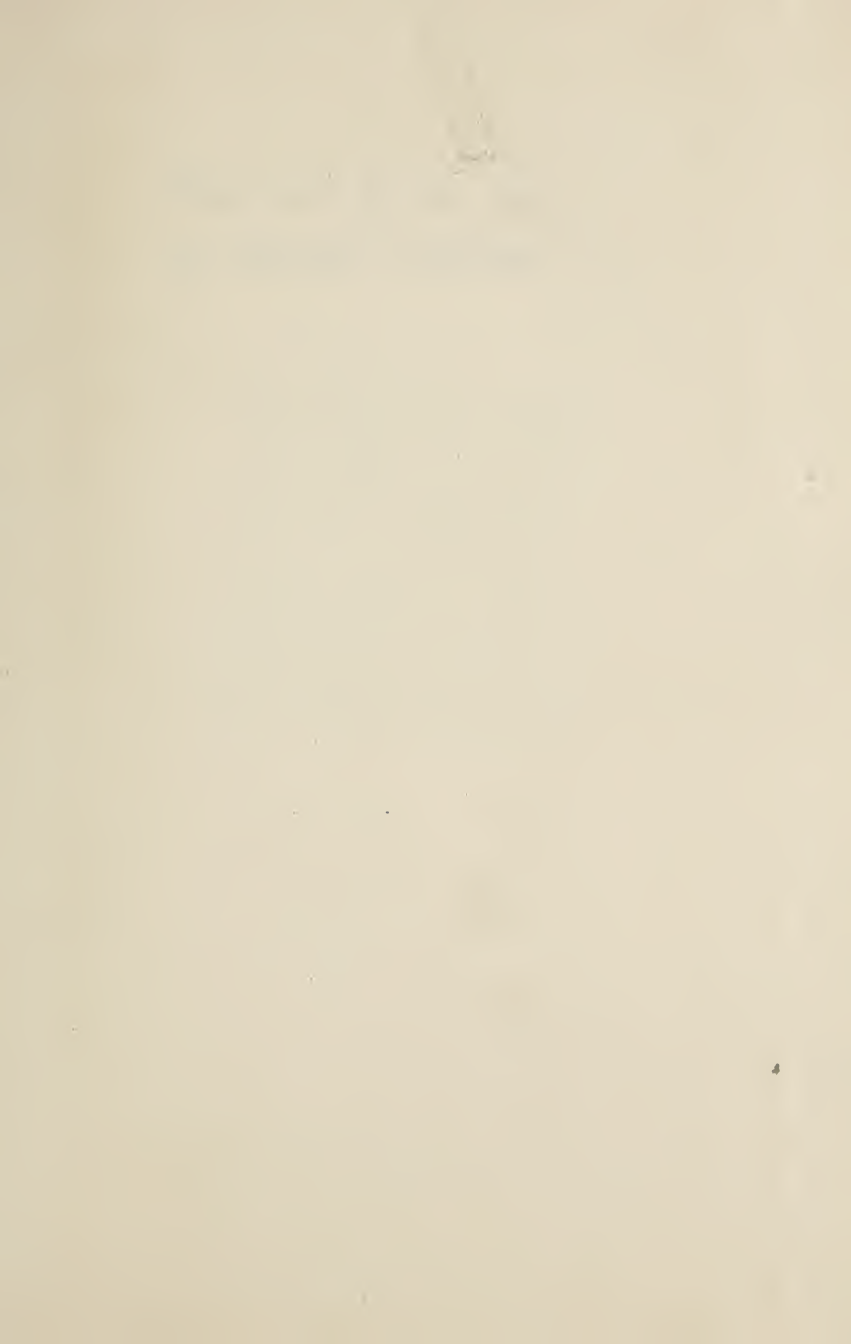


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*The Book of the Art
of Cennino Cennini*



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The Book of the Art of Cennino Cennini

A Contemporary Practical Treatise
on Quattrocento Painting

Translated from the Italian, with
Notes on Mediæval Art Methods
by CHRISTIANA J. HERRINGHAM

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P R E F A C E

MRS. MERRIFIELD'S translation of Cennino's treatise, *Il libro dell' Arte o Trattato della Pittura*, the only English one existing until now, was made from Tambroni's Italian edition of the manuscript he found in the Vatican, which was also used for the French edition by Mottez. This MS. of the eighteenth century is deficient in sixteen chapters which are to be found in the two earlier Florentine MSS., the *Riccardiana* and the *Laurentiana*. These are Nos. 162-177 inclusive. The translation is often very incorrect,¹ owing perhaps to a want of practical knowledge of the processes; but the style is pleasant, and I have kept as far as possible to the words I had grown accustomed to before I knew the original Italian. The recent German translation by Ilg is made from the Italian edition printed by the Milanesi from the Florentine MSS. in 1859, and was corrected from the MSS. I have used the same Italian edition; and the German edition has been a most valuable book of reference in translating difficult passages. I found a few inaccuracies, but was probably prevented by it from making

¹ Mrs. Merrifield's other translations, especially from Latin, seem to be very accurate.

Preface

more and worse mistakes myself. My justification for undertaking a new translation is that I have really used the treatise to learn tempera-painting, and that I have for a good many years been trying to find out how to produce by this method the various effects of fifteenth-century painting, having also read everything else I could find that might bear on the subject.¹

My quotations are all taken direct from the original MSS. or the best editions of them.

To conclude, I borrow a short passage from the preface to the French edition of Cennino by Mottez. Commenting on the claim made by Tambroni that the treatise proves that oil-painting was invented in Italy, he says :—

“Oil-painting, whether invented in Italy or not, has certainly produced many masterpieces, but destroyed monumental painting, not only in developing the taste for petty things and petty methods, but also in rendering the labour so slow and so arduous, that in this method a great undertaking seems impracticable. . . . If the middle ages preferred fresco and tempera, that is, size-vehicles, monumental painting proves the justice of the preference, and the work of Cennino establishes victoriously that it was not done through ignorance.”

¹ A more detailed examination of the old art-treatises than is possible in the limited space of these notes will be found in a German book published by Ernst Berger in 1897, *Beiträge zur Entwicklungs-geschichte der Maltechnik*, Pt. III. The two first parts are about classical art.

CONTENTS

	PAGE
OF THE AUTHOR OF THE 'TRATTATO'	ix
THE PEDIGREE OF THE 'TRATTATO'	xv
THE BOOK OF THE ART	i
NOTES ON MEDIÆVAL ART METHODS—	
THAT ITALIAN TEMPERA WAS YOLK-OF-EGG	
PAINTING	183
EXPLANATION OF THE TEMPERA-PAINTING OF	
THE 'TRATTATO'	194
CHEMICAL BEHAVIOUR OF EGG-VEHICLES	210
FRESCO AND ITS RESEMBLANCE TO TEMPERA	215
EARLY OIL-PAINTING	220
GROUNDS AND SIZE	228
GILDING	239
ABOUT CENNINO'S PIGMENTS	244
ON EARLY VARNISHES	261
LIST OF AUTHORITIES REFERRED TO	265
INDEX	267

CENNINO CENNINI

OF THE AUTHOR OF THE 'TRATTATO'

THIS treatise is properly so named. It is a comprehensive technical manual, teaching everything belonging to the painter's craft in the time of the writer. It is not a mere collection of recipes like most of the monkish secrets, but a school of art, and emphatically the working directions of a man who could do what he taught. A recent German writer¹ on mediæval painting and documents (and experimenter in technical methods) speaks of its value in strong terms—"From no single later art-period have we received any work of similar origin, giving even approximately so comprehensive a picture of technical processes, as this one does, and its value rises the higher from its connection with the name of Giotto, the reformer of art. It is not only Cennino's technique and that of his contemporaries which is contained in this work, but that of the great art giants of the fourteenth and fifteenth centuries, from Giotto, Fra Angelico, and Memmi, down

¹ Berger, *Beiträge*, III. p. 93, &c.

to Sandro Botticelli, Benozzo Gozzoli, Ghirlandajo, and so on." Through Giotto he was heir to countless generations, for had not Giotto founded his new Latin or rather Italian style on the old Greek tradition, infusing new life into it, and adapting it to more modern thought? ¹

It is worth while taking a little trouble to understand the traditional and personal instruction received by even a 'humble member' (c. 1) of the great traditional school. Besides definite instruction, I think we get from Cennino just a glimpse into the moral and æsthetic sympathies of these painters. We stand by the side of one of them, and as he works and handles his materials, we appreciate better what he aims at doing with them, and how they form an intrinsic part of the soul of the picture—not only of its body. We perceive the spiritual qualities which his subtle and refined technique help to depict.

There is not much known of the history and personality of Cennino, except what he tells us himself. He was the son of Drea Cennini of the Colle di Valdelsa, and was instructed in the arts he writes about for twelve years by Agnolo Gaddi, son of Taddeo Gaddi, the godson and pupil of Giotto. His book is notes of what Agnolo taught him, and of what he had proved by his own hand (c. 1). No doubt in chapter 104 (see also c. 4) we have a picture of his own apprenticeship, which cannot have ended later than 1396, when Agnolo died, and supposing he began it when he was twelve years old, he would then be

¹ *Trattato*, c. i.

twenty-four. Chapters 9, 27, and 29 give us a little insight into the life of a painter youth at that time, and the solid advice that the pupil has the best chance of attaining greatness if he forms himself on one master—the best he can find—instead of wandering from one to another. In chapter 28 the necessity of continually drawing from nature is insisted on. Chapters 2 and 3 and 29 assert the nobility of the art, and show by what attitude of mind and restrained and decorous way of life the painter may be worthy of it. Cennino's name is absent from the rolls of the Florentine Guilds, but appears two years after the death of Agnolo in two records discovered by the Milanese at Padua. An important period in painting at Padua had just been inaugurated by the two leading followers of Giotto, d'Avanzo and Aldighiero, and here was the glorious work of the youth of the master, the frescoes in the Capella della Arena.

Both the records just mentioned relate to Donna Ricca, Cennino's wife, and are dated respectively August 13, and the end of November of the year 1398. One is about a gift to her, and the other is a legal decision affecting her. The following facts may be gleaned from the records.

(1) That the painter Cennino Cennini lived in Padua in the year 1398, in the street S. Pietro, and being in the service of Francesco of Carrara, belonged to his household. (2) That he married a Donna Ricca of the Ricca of Citadella, a large market town in the Paduan territory. (3) That he had a brother of the name of Matteo who was a native of Padua

and settled there, and was a trumpeter in the pay of its prince. The two brothers are called in these Latin instruments Cennino de Colj, and Matteo da Colle, also Matheus de Coli.

The treatise seems to have been written in Padua, judging from the words of the Venetian and Paduan patois which are introduced into it, accompanied by explanatory Tuscan terms; also because of the invocation of St. Anthony of Padua among the saints, under whose patronage the work is placed (c. 1). This conjecture seems proved by chapter 180, where the customs of the women of Padua and of Florence are contrasted, and more fear is evinced by the writer of displeasing the Paduans, as if he were living among them, and might be the sufferer from any lack of discretion.

Painters of greater renown than Cennino have died in poverty, and it has been supposed that he wrote his book as an old or elderly man, in the debtors' prison called the Stinchi in Florence, as it was thought that the following sentence at the end of the Vatican MS. gave the place and date of its composition: 'Finito libro referamus gratias $\chi\rho\sigma$ 1437. A dì 31 luglio ex Stincarum ec.'¹ This is not found in the *Riccardiana* MS.² (see Pref.). Benci, however, ascertained that the name of Cennini does not occur in the books of the prison of the year 1437, nor in any year near it. Let us hope that the sigh of relief over the accomplished task is only that of a copyist and not of the original author.

¹ Or '1437 Anno Domini' may be intended.

² Is apparently found in the older *Laurentiana* Codex.

The Author of the 'Trattato' xiii

When Cennino arrived in Padua, the series of frescoes of Santa Felice in the Church of St. Anthony and in St. George's Chapel had been completed. Giusto of Padua, a fellow-pupil of his master Agnolo, was still alive, as he only died in 1400. It has been conjectured that he may have had a share in the frescoes of the hall of the palace (Crowe and Cavalcaselle), or in the works of the choir of the Capella dell' Arena (Milanesi). Vasari mentions paintings by Cennino, which he had evidently seen, at the end of his little notice of the painter in Agnolo Gaddi's life. It is worth quoting.¹ "Cennino di Drea Cennini, of Colle di Valdelsa, learned painting from this same Agnolo, and for love of his art he wrote with his own hand on the methods of painting in fresco, in tempera, in size, and in gum, and besides how to paint in miniature, and how gold is laid on for all these different kinds of painting, which book is in the hands of Giuliano, a Sienese goldsmith, an excellent master and a friend of these arts. At the beginning of his book he treated of the nature of pigments, minerals, and earths, as he had learned from Agnolo his master, wishing, as perhaps he had not succeeded in learning to paint perfectly, at least to know the way to use colours, temperas, sizes, and how to make grounds; and which colours must be avoided in mixture as injurious to each other, and in short many other matters, about which it is not necessary to speak, all those things being well known in our day which in those times they thought very

¹ Translated from Milanesi's *Opere di Vasari*.

secret and uncommon. I will not however omit that he does not make mention of certain earth colours; perhaps they may not have been in use; as red earths, dark earths, cinabrese, and certain vitreous greens. These must also have been rediscovered: umber, which is an earth colour, giallo santo (a yellow lake), smalts for fresco and oil-painting, and vitreous greens and yellows, which were wanting to the painters of that age.¹ Finally he treated of mosaics, of grinding colours in oil to make red, blue, green, and other coloured grounds, and for mordants for putting on gold, but not for figures (*ma non già per figure*). Besides the works which he carried out in Florence with his master, there is by his own hand under the loggia of the hospital of Bonifazio Lupi, a Madonna with certain saints, coloured in such manner that it is very well preserved at the present day.”²

¹ Cennino mentions cinabrese—and sinopia, a red earth, and dark as well as light ochre.

² When the loggia of this hospital was rebuilt in 1787 this picture of Cennino's was detached from the wall, transferred to canvas, and deposited in the Academia delle Belle Arti. Finally it went to the guardaroba of the hospital of Santa Maria Nuova, but so disfigured and badly repainted that it is impossible to know what it may have been originally (Milanesi's "Vasari," I. 645, note). I could not find this picture.—C. J. H.

THE PEDIGREE OF THE 'TRATTATO'

THE derivation of Giotto's school from 'Greek' sources which is apparent in the paintings themselves is supported by the internal evidence of the *Trattato*, that is, by its close family likeness to other 'Greek' or Byzantine manuals. Giotto's art was the stirring of the soul in forms which had been sleeping for centuries. The detailed account given by Vasari of the Greek painters invited to Florence by the governors of the city, who inspired the young Cimabue, afterwards Giotto's master, has so far received no authentication from documents, but is not therefore proved false. No work which can with certainty be ascribed to Cimabue is known,¹ but he may have occupied a place in Florentine art similar to that of Duccio in Sienese painting, who, though a contemporary of Giotto (he died 1339, and Giotto 1336), is much nearer to the Byzantine manner than Giotto. "Duccio must have got his training from some Byzantine master, perhaps at Constantinople itself. Whoever and wherever this master was, he must have been imbued with the feelings of that extraordinary revival of antique art which began at

¹ "Lectures on the National Gallery," J. P. Richter.

Byzantium in the ninth and lasted on into the thirteenth century.”¹

Giotto did not suddenly evoke an entirely new art. He was the child of the best Byzantine art, the young son of an old mother, able in a freer atmosphere, unfettered by the trammels imposed by the Eastern Church, to inspire with the truth of life the old types and picture-schemes while retaining his inheritance of classic dignity. He inherited ideality, the art of composing within a given space—a knowledge of grace, of posing, of proportion. He added to this a convincing reality and truthfulness of sentiment and action—dramatic force, human passion, touches of nature and accident. But “we always come back to this, that the inventions which we are inclined to ascribe to the little-creative middle ages, are only accomplishments of the thought of Græco-Christian antiquity.”²

Byzantine art has been too often thought lifeless and childish in ignorance of the best, or in contempt of its ideals. The period of the Comnene emperors, [middle of eleventh century till sack of Byzantium, 1204], produced the finest MSS. One of these, now in the British Museum,³ contains figures of real beauty, which show what quality of art the Italian renaissance of painting had for its starting-point.

¹ “The Central Italian Painters of the Renaissance,” Berenson, p. 41, note. Dr. Richter concurs in this opinion.

² Religious Art, *Schriftquellen zur Geschichte der Karolinischen Kunst*, J. von Schlosser, p. 324.

³ “Martyrology,” by Simeon Metaphrastes. In show-case.

Pedigree of the 'Trattato' xvii

It is not possible to attempt here even the bare outline of the history of church-painting through the middle ages. Churches were universally covered with painting inside, and where the architecture was Gothic, with sculpture outside.¹

Elaborate rules existed for the composition and arrangement of the 'Stories' of the pictures. Such is the second part of the *Hermeneia*. In the remains of all this painting which still exist, the best being miniatures in MSS., the close resemblances of subject, grouping, poses, and drapery point irresistibly to the existence of a recognised source or fountain-head of actual pictures which were copied and re-copied: as in Russian monasteries now new Icons are copied from the old greatly cherished models which are kept and handed down from generation to generation. A very remarkable collection of old Russian sacred pictures or Icons, belonging to Mr. Rae of Birkenhead, contains a good many examples so like early Sienese painting that they appear to be of one school. The merits of both are almost entirely those of the traditional Byzantine art, which is not only quaint and curious but has its own beauty—or rather, grandeur—'si profond si merveilleux, si admirable,' as Victor Hugo calls it.

It is a debated point whether, wherever we find a survival of classical forms, we must trace it to a Byzantine source, but in the main I believe that to be the truth. In Roman times painting did not become truly cosmopolitan, but remained principally in the

¹ See "Christian Iconography," Didron.

hands of Greeks, and retreated with them to the Eastern Empire, which retained its ancient splendour.¹

The Church in the East controlled the invention of the painters much more than it ever attempted to do in the West, but probably for a long time this rather had the effect of raising than debasing the standard. The kind of uniformity enforced by the well-known canon of the Second Council of Nice need not be derogatory to the painter's art. To be debarred from novelty may direct the attention to nobility. "The composition of the figures is not the invention of the painters, but the law and tradition of the Catholic Church, which has been proved. For what excels in ancient things is to be venerated, as says St. Basil, and this purpose and tradition is not the part of the painter (for his is only the art), but is the ordination and disposition of our fathers."

I will now give a slight sketch of the way the *Trattato* is linked to the old Græco-Roman art by way of the Byzantine, how it carries on the same technical traditions through a connected literature reaching back to the Augustan age. Giotto had learned and handed on the methods of the Greeks plus his own improvements,² and Cennino wrote this out with further improvements. Fortunately that kind of thing had been done before, and often enough to bridge the centuries

¹ See *Quellen der Byzantinischen Kunstgeschichte*, Unger; "The Church of St. Sophia," Lethaby.

² The change which he wrought "from the Greek to the more modern manner" is considered by some to apply partly to technique. Ilg and Berger suggest the final discarding of wax and of dark varnishes, and the readoption of egg vehicles.

Pedigree of the 'Trattato' xix

fairly well. The best way to give some notion of the written traditions (if I may be allowed the apparent contradiction in terms) is to begin with a few short statements of our knowledge of classical technique so far as it is relevant to the subject in hand. Theophrastus, Aristotle's successor in the peripatetic school (about 370-368 B.C.) is, I believe, the only really ancient Greek who has written on the technical side of art. The fragment of his history of stones which we possess gives some account of a few painters' and builders' materials. Vitruvius, in the Augustan age, wrote on architecture, taking his theories from Greek books, and the practical part from his own experience. He describes the preparation of the wall for painting in fresco, and gives a list of pigments similar to Pliny's, but shorter. Pliny the elder (A.D. 23-79) seems to have taken a great interest in painting, especially in the pigments used, of which he has evidently given as full an account as he could collect. He principally compiled from Greek authorities.

Vitruvius twice speaks of painting on wet plaster, *i.e.* lime and marble-dust stucco, and explains how everything solidifies with the lime into one mass, and "the colours when they are carefully laid on the wet plaster do not come off, but are permanent for ever." Pliny names the colours which will not bear the wet plaster but must be painted on chalk. In another place he says *cæruleum* will not bear lime, and again that a particular kind of 'sil' (yellow ochre) resists the bitterness of the lime. Neither is clear about the method of painting pictures on walls, and the very

large spaces at Pompeii without joins make it difficult to understand how fresco alone can have been used, even allowing for the slow drying of a much thicker stucco than is ever used now, and for extreme sureness and rapidity in painting.¹

A recent conjecture has been that the broad coloured spaces were fresco, and that this is all that Pliny and Vitruvius give any account of—and that the subject painting may have been done with a watery emulsion of wax partially saponified, which would combine chemically with the lime. Many theories have been held at various times as to how wax could have been used on walls.² As both Vitruvius and Pliny say that black for coating walls must have an admixture of glue (*i.e.* size), and as Pliny describes how *purpurisum* could be painted over *sandyx* (perhaps here red lead) to imitate vermilion, and over *cæruleum* to make purple by mixing it with egg, it has sometimes been assumed that wall-painting was finished in *secco* in the same way as in the middle ages; but the extreme endurance and freshness of Pompeian painting put these perishable vehicles out of court, unless merely used as an assistance in working on the wet stucco.³

Some small pictures, especially portraits, were painted with colours mixed with wax, heat being used

¹ See Helbig and Donner, *Wandgemälde von Vesuv verschüttelten Städten*.

² Berger's *Beiträge*, Parts I. and II.

³ In a process of *buon fresco* now used in Jeypore, a little size is used in applying lamp-black and red lead, and a little gum with the other colours, green, yellow, and brown earths. The protecting crystallisation of the lime takes place.—Quoted from *R.I.B.A. Journal*. See Millar's "Plastering," p. 220.

Pedigree of the 'Trattato' xxi

in some way in the process to blend and fix the painting. The Hawara portraits taken from mummies, in the National Gallery, the British Museum, and the Louvre give some notion of this kind of painting, wonderfully forcible in spite of incorrectness and coarseness of drawing and modelling. Wax paint mixed with resins, oil, or balsams was used for ordinary decorative purposes on buildings and woodwork and ships as we use oil paint, and wax liquefied with a little oil, and driven into the wall with heat, was used to protect vermilion, and perhaps other wall-painting.

Other materials used by painters were: Rhodian glue, made from the ears and certain other parts of the finer integument of bulls; gum from the Egyptian thorn and the sarcocolla. Fish-glue, *i.e.* ichthyocolla, is named, but not its uses. A good many resins and oils were known to Pliny, and the fact that resins can be dissolved in oil.

Taking two passages in Pliny together, we get the method of gilding most used all through the middle ages—"Gold-leaf is laid over marble, &c., with white of egg, on wood with glue properly composed; they call it leucophoron." In another place he says that sinopia (a red earth), light sil (yellow ochre), and melinum (a white earth), in certain proportions make leucophoron. In the old Russian manual of painting, the *Podlinnik* (see p. xxxii), of Byzantine origin, the ground of chalk and size on panels (no doubt overlaid with gilding), is called leucas (Russian *Levkass*) from the Greek word λευκός, meaning light, or bright-coloured; the original meaning of

leucophoron in Pliny's time being, I suppose, that which bore the bright gold coating.¹

There can be no doubt that some kind of painting which may broadly be called tempera was known to the ancient Greek painters, as well as to the Egyptians, but the arguments are too complicated to be given here.²

These scraps of information in Pliny about practical work must have been picked up here and there from craftsmen, or from workshop note-books, and one such document dating from the period of the Roman Empire has been preserved, namely, the Leyden Papyrus, found in a tomb at Thebes, and dating from the third or the beginning of the fourth century A.D.³

This Papyrus, the manual of a worker in metal or alchemist, who was perhaps also a scribe, has affinity in some of the recipes to phrases contained in Pliny and Vitruvius and other authors, and in some to the writings of the Greek alchemists. There are about sixteen formulas relating to gold and silver writing, which writing on papyrus, stone, or metal, engaged the attention of the Egyptian scribes.⁴ On

¹ "Iconographie Sacrée en Russie" (*Revue archéologique*), vol. vii. pp. 174, 234, 321.

² Pacheco, the master of Velasquez, basing his opinion on the allusion to egg as a vehicle for purpurissum, says, "Much veneration and respect is due to painting in tempera for having had its birthday with art itself, and for being the first which was practised in the world, and in which the famous ancient artists did so many marvels."—*Arte de la pintura*, 1641.

³ *Papyri Græci Musei Antiquarii publici Lugduni Batavi*, &c. Edited C. Leemans, tom. ii. Papyrus x.

⁴ See *Histoire de la chimie du moyen-âge*, Berthelot, pp. 3-73.

Pedigree of the 'Trattato' xxiii

the three last pages are extracts chiefly relating to pigments from Dioscorides¹ (*De materia medica*, Book V.). The following passage (*Papyrus*, p. ix. c. 7) seems to contain the earliest reference to white of egg and gum mixed as a tempera for colours. "Mixing the flower of cneus (crocus?), white gum, and the white of an egg in a shell, mingle it with the bile of tortoise (yellow), just as you do for colours, then use. But calf's bile acts on the surface very sharply." This is for a simulated gold-writing. Now comes a real rivet in the continuity of documents. The earliest mediæval 'workshop note-book,' that variously called the Byzantine MS., the Lucca MS., and Compositiones, in Italian handwriting of the eighth century, is evidently translated in part at least from Greek originals, and besides in several passages resembling the *Papyrus*, has one which is textually identical with another of the numerous formulas for gold-writing contained in that manuscript, showing how widespread and interlinked these technical processes must have been. The *Papyrus* was probably entombed nearly four centuries before the Lucca MS. was written.

The Lucca MS.² consists of short practical recipes for making coloured glass, dyeing skins, gold-beating and gilding, for making various glues, varnishes, and a few pigments, including the first distinct directions for making artificial vermilion; also of long lists of

¹ Said by Suidas to have lived under Antony and Cleopatra, perhaps later.

² In the cathedral library at Lucca, and very carelessly and incorrectly printed by Muratori.—*Antiquitates Italicae*, II. p. 365.

substances useful in the decorative trades, with some description of their nature—in fact a miniature ‘historia’ of minerals. (For the recipes for oil and varnish contained in this MS. see p. 262.)

The very little and vague information which this MS. affords about painting seems to be nearly the same as Pliny’s. There are some indications of fresco. Fish-glue—ichthyocolla—is distinctly spoken of as a tempera for colours. Bull-glue makes the priming for gilding, with gesso and white of egg, prepared by whipping (subtile), as the mordant. Several simple and elaborate varnishes are described for colouring tin, and for protecting both gold and painting. Besides the passages which supply this information, there is one mentioning vehicles for painting which is not altogether unambiguous, therefore I give the Latin as well as the translation.¹

“All these things we have described from the earth and the sea, from flowers and herbs, we have explained their virtues and the operations of all painters with them on walls and on wood, on linen cloths and on skins. Thus we note these operations with them all on walls simple, on wood the colours being mixed with wax, on skins fish-glue being mixed” (*i.e.* on parchment for books). “Hec omnia exposuimus q̃a q̃a ex terrenis maritimis floribus vel herbis exposuimus virtutes vel operationes earum in parietibus et lignis linteolis pellibus et omnium pictorum. Ita memoramus omnium operationes q̃ in parietibus

¹ I have a photograph of this page of the MS. Berger, quoting the passage, omits the ‘in’ between *simplice* and *ligno* (*Beiträge*, Part III.).

Pedigree of the 'Trattato' xxv

simplice in ligno cere commixtis coloribus in pellibus ictiocollon commixtum." Simplex means properly unmixed, and the untempered or water-tempered painting of fresco seems intended. But a different rendering has been suggested by the advocates of wax theories for wall-painting, who, setting aside the three clauses made by the repetition of the word 'in,' translate "operations on walls and wood with colours simply mixed with wax, and on skins with fish-glue." Wax-painting is continually alluded to by the fathers of the Church, especially for portraits and painting on panels; sometimes wall-painting seems to be intended. Wax has been found in one or two analyses of mediæval pictures of much later date than this MS.; but in these cases it seems most likely to be a kind of varnish over tempera, like the protecting wax and oil of Pliny and Vitruvius over vermilion. Branchi analysed bits of paint from very early Pisan pictures. Those having a bright surface gave indications of wax used as varnish, but not those having a dull surface. The most certain signs of this substance are obtained from pictures which can be attributed to the time of Giunta, from which period gloss and wax diminished.¹

In some alterations in the Ste Chapelle, an early painting of the Annunciation was found painted on the bare stone. First there was a fatty resinous ground, then an orange-red cement, then leaf-gold, then pure fresh colour, lastly wax.²

A great part of the Lucca MS. is repeated in the

¹ Morrona's *Pisa illustrata*, edition Livorno, 1812.

² Henry and Cros, *L'encaustique*.

Mappæ Clavicula (the little key of drawing), a MS. of the twelfth century, which also contains a treatise on metals, having a striking resemblance to the Papyrus, and further instances of textual identity with it.¹

As it contains one or two English words, this MS. was probably written in England. There is another copy at Schlettstadt in Alsace, written in the tenth century. The French chemist Berthelot has shown that the industrial practices of these related MSS. (Papyrus, Lucca, Clavicula) were linked with certain scientific and mystic (alchemical) theories which subsisted without interruption in the trade notes of the arts and crafts from the Roman Empire through the Carolingian period and onwards; he claims that the Arabs had learned their chemical knowledge from the Greeks, but that a good deal was inherited by the Byzantines without Arab intervention; he finds correspondence between these three MSS. and alchemical Latin MSS. of the Bibliothèque Nationale at Paris (as 6514, fol. 44-52), and continues the series with the *De Artibus Romanorum* of Eraclius, the *Schedula Diversarum Artium* of Theophilus, the *Liber Diversarum Artium* (Bibliothèque de l'école de médecine, Montpellier), the treatises published by Mrs. Merrifield in *Ancient Practice of Painting* and so through the later *secreti* and treatises of the sixteenth and seventeenth centuries to the workshop recipes of our own time—such as, in France, the *Manuels Rorets*.

The *Schedula* of Theophilus belongs to the same

¹ Edited by Sir T. Phillips, and communicated by him to the Society of Antiquaries.

Pedigree of the 'Trattato' xxvii

technical school as the earlier documents we have been considering. Æsthetically its art is Byzantine. Thus it links the later MSS. which closely resemble it to that Byzantine art of which it is a product, and which itself was founded on the classical tradition. These later documents are the *Hermeneia*, which is the old Greek Church manual from Mount Athos, and Cennino's *Trattato*, the three having so strong a family likeness that they cannot but have one and the same pedigree.

The author of the *Schedula*, the monk Theophilus, was himself clearly a worker in metal, and on this subject evidently gives his own experiences with first-hand freshness and originality, but he collected a good deal of traditional information about painting and other arts such as glass staining and painting, perhaps copied from other writings. It is practically certain that he copied from Eraclius. He probably lived at the end of the eleventh or the beginning of the twelfth century, and was a German. Greece (that is, probably some Byzantine manual which he copied as he copied Eraclius) by this time meaning Byzantium, was his mistress in painting. "Should you carefully peruse this, you will find out whatever Greece possesses in kinds and mixtures of various colours; whatever Tuscany knows of in mosaic work, or in variety of enamel; whatever Arabia shows forth in work of fusion, ductility, or chasing; whatever Italy ornaments with gold, in diversity of vases and sculpture, of gems or ivory; whatever France loves in a costly variety of

windows; whatever industrious Germany approves in work of gold, silver, copper, and iron, of woods and of stones." The book begins with the composition of flesh tints and the method of painting faces like Cennino's directions in chapters 67 and 147. No tempera is given, but as white lead is the white pigment, fresco is not primarily intended. A distinction is made between painting on lime on walls and painting 'in laqueari,' which generally means panelled ceilings, but may possibly have come to mean plaster of Paris or chalk and size stucco. The wall-painting is described as being done on a well-wetted wall, the colours being made adherent by being mixed with lime—hardly true fresco. Lazur (blue) was painted with yolk of egg abundantly mixed with water (otherwise yolk of egg¹ is not mentioned) over a ground of 'veneda' made of black and lime—also laid under green; while red earth was to be laid under cinnabar. Pliny speaks of giving an undercoat of syricum (probably red lead) to minium (vermilion and the cinnabar of Theophilus) to save expense; and in his account of chrysocolla (probably powdered malachite) he says, "They underlay the sandy sort however with atramentum (black) before they lay it on, and with parætonium. These are tenacious of it and soft to the colour. Parætonium because it is by nature unctuous, and very tenacious on account of its fineness. It is coated with atramentum that the whiteness of the parætonium may not give pallor to the chrysocolla." Wax is not mentioned at all in

¹ Except in the later addenda, Eng. ed.

Pedigree of the 'Trattato' xxix

the *Schedula*. Instead of it linseed oil, or preferably gum, as it dries quicker, are to be used for pictures on panels. Gilding is similar to Pliny's, on a size and gypsum or chalk ground, and white of egg beaten and clarified is the mordant. Oil-paint without wax is here used for painting wood-work. The varnishes are simpler than those in the Lucca MS., only one resin being used for each varnish, one being probably amber, the other sandarach. For books most colours were tempered with gum; minium, ceruse, and carmine, with white of egg. In the third book, the preparation of fish-glue is given, Pliny's ichthyocolla, made from the bladder of the sturgeon or huso; its use is for gold-work, and perhaps as an alternative to gum for book-painting.

A group of MSS. of French origin belong to the same school as the *Schedula*; these are the third book of Eraclius,¹ the book of Peter St. Audemar, the Sloane MS. (B.M., 1754), and some part of Le Bègue's MSS.,² especially the French recipes. The two first seem to date from about the turn of the twelfth and thirteenth centuries, or earlier. They embody a good deal of the material of Theophilus, often in the same words, either showing that his work was a widely used authority, or that both writers compiled from a written or oral technical tradition practically the same in all monasteries where painting was carried on. Something of this sort is the more likely supposition.

¹ The first two books of Eraclius are very early and are quoted by Theophilus. Otherwise they cannot be dated. They may embody a bit of somewhat local Italian art tradition.

² Bibliothèque Nationale. Pub. "Ancient Pract. Paint."

It is clear that the use of oil and varnish was general, but there is nothing in any of these MSS. to prove, as we find in the *Schedula*, that oil was used for pictures. Both in St. Audemar (c. 180) and Le Bègue's French recipes (315-317, 344-345) we find a reminiscence of the flesh-painting scheme of the *Schedula*, with similar names for the compound tints; and, departing very far from the original, in the Bolognese MS. (190-192). The following short paragraph from Eraclius (iii. 28) sums up the usual vehicles other than oil of the school and period. "Of the general practice in grinding all colours—You must know, however, that all colours may be ground with clear water, if they are allowed to dry—and then with white of egg, or oil, or gum-water, or wine, or cervisia (beer), when they are mixed or tempered." When we come to the individual recipes, we find that yolk of egg was used to a limited extent as a preferable medium for some colours (vermilion, orpiment), or added to the white of egg in small proportions. It made the colours flow better from the pen.

Among Le Bègue's French recipes¹ is one of very considerable interest, being a water for distempering all colours, made by combining an emulsion of saponified wax with fish-glue and mastic (for recipe, see p. xxxiv). The *Hermeneia* contains a recipe for combining wax saponified in the same way with potash water, to make a preparation to give gloss to the painting. These wax-containing temperas are

¹ Of this part of the MS. it can only be said that its contents are not of a later period than the beginning of the fifteenth century. Le Bègue wrote out the various material he had collected in 1437.

analogous to the present process called Milanese stucco,¹ and through this are perhaps continuous with the Kausis or wax-polishing of the ancients, and may show that wax was used by them in painting on walls, but differently from the process employed on panels. This may explain the meaning of a passage in Pliny, "Waxes are dyed with these same colours for those pictures which are to be burnt in, which is another way from that used on walls, but customary for ships of war" (the latter were painted with wax combined with wood tar).² Pliny describes a preparation of wax with alkali. It is said that saponified wax makes a remarkably insoluble compound with fresh lime plaster, but, used in such small quantities as are directed in the recipes of the *Hermeneia* and the *Le Bègue MS.*, would not easily be detected by analysis.

The *Hermeneia*, or Guide to Painting, of Mount Athos was found in the year 1839, by Didron, in use by the painter monks of that strange town of monasteries. He succeeded in getting a copy made, and had it translated into French. He gave his Greek copy to the King of Bavaria. A German translation has also been published, and a Greek edition. It professes to be the teaching of a painter, Manuel Panselinos, of Thessalonica,³ whom Didron calls the Giotto of the

¹ *Beiträge*, Parts I. and II. ; also Henry and Cros, *L'Encaustique*.

² *Ceræ tinguntur iisdem his coloribus ad eas picturas quæ inuruntur alieno parietibus genere, sed classibus familiari*, xxxv. 49.

³ That is, Salonica, formerly a great school of painting at the gate of Mount Athos, the monastery town, which was founded about the beginning of the seventh century, but the date is uncertain. The family of the Comneni bestowed great privileges on the existing monasteries, and added to their number (1056-1204).

school, who lived in the eleventh or twelfth century. The *Hermeneia* consists of two parts, one technical; the other describes the treatment of the subjects to be depicted. It was written by a monk Dionysios, and seems to embody an older work, as there are two prefaces, one composed by Dionysios and another. It is not known when he lived. At the time of Didron's visit, there were four ateliers on Mount Athos, each having its own copy, somewhat varying from one another. The first he tried to buy had marginal notes by later hands. The evidently different dates of the teaching of the Guide are accounted for by the successive incorporation into the text of such notes whenever a new copy was made. There is some evidence that the original of Didron's MS. was written between 1500 and 1630.¹ One wants to linger over this weird survival of the old-world *bottega* with masters and journeymen and apprentices, where the book of the art was laid open in the midst, and the pupils read from it in turns in a loud voice, as the others painted in obedience to its directions.²

In Russia two similar but not identical books exist, called the *Podlinnik* and the *Stoglaŭf*; the latter claims to be influenced by the Athos school, which it states to have been 'founded by Manuel Panselinos,

¹ *Beiträge*, III. 67-71.

² This account of Didron's visit has not been published at length in English. There are extracts from it in the notes to the English edition of Theophilus. See *Iconographie Chrétienne*. Later visitors say the school is in the last stages of decadence.

Pedigree of the 'Trattato' xxxiii

a painter of the eleventh century.' Neither of these are accessible.

In the *Hermeneia*¹ the whole work of the elaborately decorated chancel screens is unfolded in great detail; that is, the grounding with gesso and size for the gilding and pictures, and their preparation; baking and slaking the gesso, and boiling the size from skins. Skins of oxen being used for glue, and especially the ears, reminds us of Pliny. The method, however, of gilding with tallow in the bole preparation, the leaf applied with spirits of wine, and the plaster priming containing linseed oil and soap, is different from any other old gilding directions, but closely resembles some modern methods. In any colouring that has to be done behind the gilded fretwork as a relief to it, egg is to be used to mix the colours. Didron translates the Greek word by egg simply, Schäfer always by white of egg. Berger is of opinion that by *avrov*, used alone, the whole egg is intended, both here and for painting on stretched and primed canvas, and that yolk of egg alone is not intended or mentioned at all. White of egg forms part of the mordant for burnished gold, and here it is specified. The Greek word which would properly designate yolk of egg is not used. No tempera of any kind is mentioned for painting the 'numerous and large pictures' forming part of the choir screen, but as 'egg' is the vehicle

¹ It is unfortunate that the German and French translations were both made by men who understood nothing of painters' materials, and are on these points inexact, but the Greek edition was collated by Berger for his *Beiträge*, and he has been able to explain some of the obscurities of the earlier French and German editions of Didron and Schäfer.

used in painting on primed canvas, on mother-of-pearl and behind the carving on screens (size being here an alternative), and in the 'Moscovite' method of blue and gilding only, we may consider that it was equally used on panels.

It is in the colouring for flesh of Panselinos that we notice the affinity to Theophilus; and here it is worthy of notice that white lead is the white used, as in the directions for flesh-painting in the *Schedula*. White lead is the only white pigment mentioned in the Lucca MS.

A comparison should be made between the extracts from the flesh-painting of the *Schedula* and the *Hermeneia* with each other (see p. xxxv), and with the fresco chapters of the *Trattato* of Cennino. The recipe for a solution of wax capable of receiving a polish which may explain the gloss of the Pisan pictures has already been mentioned. Equal quantities of wax, potash lye, and size are melted together on the fire. The colours are painted with this, which can be polished so bright that it is useless to apply varnish. What exactly is meant by the equal quantities is difficult to say. Le Bègue's somewhat similar compound¹ is: 1 lb. lime, 12 lbs. ashes, boiled well in water; take 4 lbs. of the strained water, 1½ oz. fish-glue, 2 oz. wax, 1½ oz. mastic, all boiled together. 'With this water you may distemper all kinds of colours.'

The oil-painting of the MS. evinces greater familiarity with the technique than Cennino possessed, and is a late addition. The passage directing spirits of wine to

¹ *Ancient Practice of Painting*, I. 307.

Pedigree of the 'Trattato' · xxxv

be used in varnish-making is not likely to be of the date of the earliest part. Most of the pigments have Eastern names.

The vehicle for icon-painting in Russia, according to the *Podlinnik*, is egg-yolk, with a final coating of boiled oil, this being the cause of the darkening of the old pictures. Egg was used instead of oil, which was considered to be a production of the hand of man, and unworthy of taking part in representing the Divinity.¹ The use of yolk of egg to paint the colours in Abyssinian MSS. which Curzon saw and tells of in his "Monasteries of the Levant," p. 107 (a very amusing account), may have been inherited from the ancient Egyptians.

The very last echo of Greece is in the Strasburg MS. (early fifteenth-century), wherein the writer claims to have taught honestly to the attentive how to paint according to Greek customs with two waters, *i.e.* dissolved gum and prepared white of egg, meaning evidently by Greek the 'old-fashioned' painting used in MSS.; and he then proceeds to describe the more modern oil-painting.

Synopsis of Flesh-colouring from the "Schedula" and the "Hermeneia," for comparison with the directions in Cennino's Fresco and Tempera chapters on this subject.

Schedula 1. The colour which is called flesh-colour, with which the face and the nude are painted, is thus

¹ Iconographie Sacrée en Russie (*Revue Archéologique*, vol. vii.).

composed—"Grind it (massicot), and mix it with white ceruse and cinnabar until it is made like flesh. The mixture of these colours may be made according to your will; so that if you wish to have red-coloured faces, add more cinnabar; but if clear complexions, put more white; if pallid, however, add a little prasinus—which prasinus is a preparation having the appearance of a green colour with black. . . . When you have mixed the flesh-colour, and have filled in the faces and the nude with it, mix with it some prasinus and the red which is burnt from ochre,¹ and a little cinnabar, and prepare the posc with which you will mark the eyebrows and eyes, the nostrils and mouth, the chin and the hollows round the nostrils and the temples; the wrinkles in the forehead and neck, and the rounding of the face; the beards of young men, and the articulations of the hands and feet, and all members which are made apparent in the nude."

Then follow similar details for the first rose-colour, —flesh-colour, cinnabar, and minium; the first lumina or high lights of flesh-colour and ceruse; the veneda or black, with a little white for the pupils of the eyes; the second posc being the first darkened with more prasinus and red, "so that it may become a shadow of the former colour, and fill up the middle space between the eyebrow and the eyes, and in the middle under the eyes, and about the nose, and between the mouth and the chin, the down or slight beard of

¹ Pliny: 'Without the use of usta shadows cannot be made; ' usta being properly yellow ochre burnt.

Pedigree of the 'Trattato' xxxvii

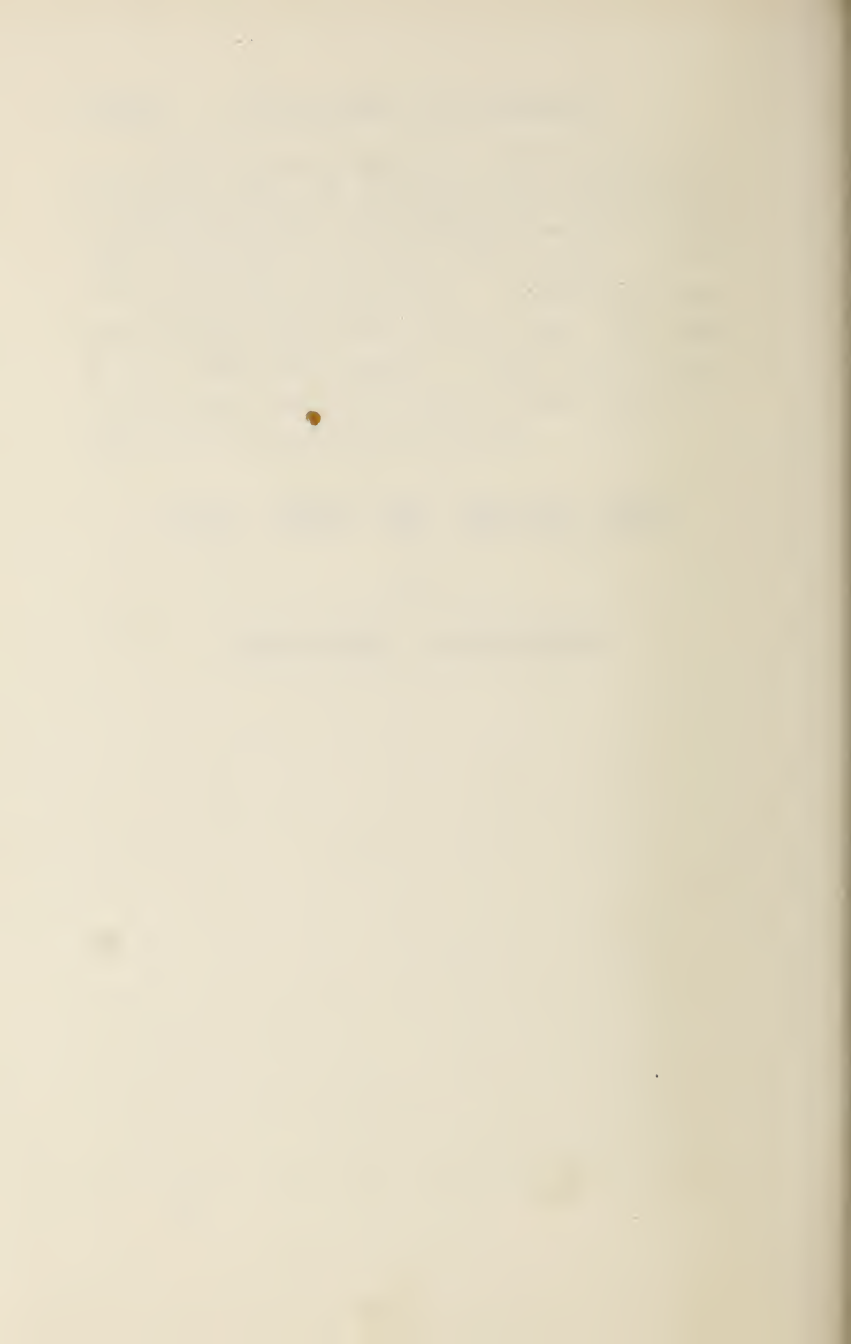
youths," &c.; then the second rose colour for heightening the first, and a brighter 'lumina' if necessary. Directions follow for the hair and beards of youths and old men.

"Hermeneia" (arranged to correspond in order with the "Schedula").

To make the flesh-colour of Panselinos: "Take Venice white (*i.e.* ceruse, or white lead) or good French white, Venice ochre, and cinnabar;" or, "Take white and reddish-yellow ochre." On the preparation of the Proplasmos of Panselinos: "Take white lead, ochre, green and black, grind all this together on marble. Collect the mixture in a pot, then ground the places where you will paint flesh." On the preparation of the glykasmos (half shadow or softening): "Take two parts of flesh-colour, and one part, or a little less, of proplasmos; unite them in a shell, and you will have a glykasmos for the flesh. . . . When you have put on the proplasmos and drawn in a face or another part, you will model the flesh with the glykasmos, of which we have given the recipe, and you will thin it at the edges so that it joins well with the proplasmos. You will add flesh-colour on the prominent parts, thinning it gradually like the glykasmos. In old men you will make the wrinkles, and in young people the angles of the eyes. Then you will use white with precaution, mixing the touches of white and those of flesh-colour first lightly, then more forcibly. This is how flesh-painting is modelled, according to Panselinos."

. . . "For the lips of saints mix white and cinnabar, for mouths only use cinnabar," &c. Corresponding to the second posc of the *Schedula* we find: "Take umber and bole; mix them on the marble; use this to draw the eyes, the mouth, &c. In the darker parts you will give shade with umber only. Add black for the pupils and nostrils." Here also directions for hair and beards are given, closely resembling those of the *Schedula* and *Trattato*.

THE BOOK OF THE ART
OF
CENNINO CENNINI



HERE BEGINS THE BOOK OF THE ART

Made and composed by Cennino da Colle, in the reverence of God, and of the Virgin Mary, and of St. Eustachius, and of St. Francis, and of St. John the Baptist, and of St. Anthony of Padua, and generally of all the saints of God, and in the reverence of Giotto, of Taddeo, and of Agnolo the master of Cennino, and for the utility and good and advantage of those who would attain perfection in the art.

CHAPTER I.¹

IN the beginning, when the omnipotent God created the heaven and the earth, above all living creatures and plants for food, he created man and woman after his own image, endowing them with all virtues. Afterwards came misfortune, through the envy of Lucifer towards Adam; who with malice and subtlety

¹ This chapter is an expression of the mania for classification in the middle ages which produced such works as the *Legenda Aurea*, the *Speculum Universale*, and numerous encyclopædias. A sketch of the kind of classification adopted, and the connection with the arts, is given in Didron's "Christian Iconography," ed. Bohn.

4 The Book of the Art

induced him to sin against the commandment of God, that is, first Eve, and then Eve deceived Adam; and God was angered against Adam, and caused him and his companion to be driven by an angel out of Paradise, saying to them, "Because you have disobeyed the commandment which God gave to you, by your labour and exertions shall you support yourselves." Then Adam, knowing the sin he had committed, and being nobly endowed by God, as the root and origin and father of us all, discovered by his wisdom that it was necessary to find a way to live by his own manual exertions, and thus he began by digging and Eve by spinning. Afterwards he carried on many necessary arts, different each from the other, and each more scientific than the other; for they could not be all equally so. Now, the most worthy is Science; after which comes an art derived from science and dependent on the operations of the hand, and this is called Painting, for which we must be endowed with both imagination (*fantasia*) and skill in the hand, to discover unseen things concealed beneath the obscurity of natural objects, and to arrest them with the hand, presenting to the sight that which did not before appear to exist. And well does it deserve to be placed in the rank next to science, and to be crowned by Poetry: and for this reason, that the poet, by the help of science, becomes worthy, and free, and able to compose and

bind together, or not, at pleasure. So to the painter liberty is given to compose a figure, either upright or sitting, or half man, half horse, as he pleases, according to his fancy. Therefore, whether through great reverence or love, let all those persons who feel in themselves any kind or manner of knowledge, or power to help and adorn these principal sciences with some jewel, put themselves forward without any bashfulness, offering to the above-named sciences this little knowledge which God has given them.

A humble working member then of the art of painting, I, Cennino, born of Drea Cennino of the Colle de Valdelsa, was instructed in these arts for twelve years by Agnolo, son of Taddeo of Florence, my master, who learned the art from Taddeo his father, who was the godson of Giotto, and was his disciple for twenty-four years. This Giotto changed the art of painting from the Greek to the Latin (manner), and brought it to the modern (style); and he possessed more perfect art than ever any one else had had. In order to assist all those who would approach this art, I shall take note of all that was taught me by my master Agnolo, and of that which I have proved with my own hand; invoking first the high omnipotent God,—that is to say, the Father, Son, and Holy Spirit; secondly, that most delightful advocate of all sinners the Virgin Mary, and St. Luke

6 The Book of the Art

the Evangelist, the first Christian painter, and my advocate St. Eustachius, and generally all the saints, male and female, of Paradise.

CHAP. 2.—*How some persons study the arts from nobleness of mind, and some for gain.*

It is the impulse of a noble mind which moves some towards this art, pleasing to them through their natural love. The intellect delights in invention; and nature alone draws them, without any guidance from a master, through nobleness of mind; and thus delighting themselves, they next wish to find a master, and with him they place themselves in love of obedience, being in servitude that they may carry their art to perfection. There are some who follow the arts from poverty and necessity, also for gain, and for love of the art; but those who pursue them from love of the art and true nobleness of mind are to be commended above all others.

CHAP. 3.—*What to do in the beginning of the pursuit of art.*

Now then, you of noble mind, who are lovers of this good, come at once to art and adorn yourselves with this vesture,—namely, love, reverence, obedience, and perseverance. And as soon as thou canst, begin

to put thyself under the guidance of the master to learn, and delay as long as thou mayest thy parting from the master.

CHAP. 4.—*How the rule shows into what parts and members the arts are divided.*

The foundation of the art and the beginning of all these labours of the hand is drawing and colouring. To these two parts these things are necessary; namely, to know¹ how to grind colours; to use glue; to fasten the cloth on the panel; to prime with gesso, to scrape and smooth the gesso; to make relievos in gesso; to put on bole; to gild; to burnish; to temper colours; to lay on ground colours; to trace by dusting powder²; to engrave by lines and by stamps (?); to carve; to colour; to adorn and to varnish pictures. To paint on walls it is necessary to wet them; to cover them with mortar; to embellish them; to polish (smooth) them; to design, to colour in fresco and finish in secco; to temper the colours; adorn³ and retouch.

¹ Sapere tritare, o ver macinare, incollare, impannare, ingessare, e radere i gessi e pulirli, rilevare di gesso, mettere di bolo, mettere d'oro, brunire, temperare, campeggiare, spolverare, grattare, granare overo camusciare, ritagliare, colorire, adornare e inverniciare in tavola, overo ancona. Lavorare in muro, bisogna bagnare, smaltare, fregiare, pulire, disegnare, colorire in fresco, trarre a fino in secco, temperare, adornare, finire in muro. Camusciare may mean the same as granare but on a bigger scale. Grattare may mean engraving lines in the gold or scraping through the paint to the gilding beneath.

² Through pricked patterns.

³ Probably means adding the gold and ultramarine.

8 The Book of the Art

And this is the rule of the above-named grades, as to which, with that little knowledge which I have learned, I will explain step by step.

CHAP. 5.—*In what manner to begin drawing on a small panel, and how to prepare it.*

As has been said, it is necessary that you should have the habit of beginning to draw correctly.¹

First, have a small panel of boxwood a hand length wide each way, well smoothed and clean,—that is to say, washed with clean water, rubbed and polished with sepia (bone of the cuttle-fish), which the goldsmith uses for marking. When this panel is quite dry, take a sufficient quantity of bones well ground for two hours, and the finer they are ground, the better they will be. Then collect the powder, and put it into dry paper; and when you want to prime the panel, take less than half the size of a bean of this bone-dust or less, mix it up with saliva, and before it is dry spread it with the finger over the surface of the panel, and before it dries, hold the panel in the left hand, and with the tip of the forefinger of the right hand, beat upon the panel until you see that it is quite dry, and that the bone-dust is spread all over it equally.

¹ Cennino sometimes uses the second person plural, but more frequently the singular. This sounds awkward in English, and henceforth I shall use the pronoun you and not thou.

CHAP. 6.—*How drawing can be done on several kinds of panels.*

A tablet of old figwood is suitable;¹ also certain tablets used by merchants which are made of parchment prepared with gesso coated with white lead and oil, using the bone-dust as I have said.

CHAP. 7.—*What kind of bones are proper for priming panels.*

You must now know what bones are proper. For this purpose take the bones of the thighs and wings of fowls or capons; and the older they are the better. When you find them under the table, put them in the fire, and when you see they are become whiter than ashes, take them out, and grind them well on a porphyry slab, and use it as I say above.

CHAP. 8.—*In what manner you should begin to draw with a style, and with what light.*

The bones also of the leg and shoulder of mutton are good, burnt as before directed. Then take a style of silver or brass, or anything else provided the point is silver, sufficiently fine (sharp) and polished and good. Then, to acquire command of hand in using the style, begin to draw with it from a copy as freely

¹ È buona la tavoletta del figaro ben vecchio.

10 The Book of the Art

as you can, and so lightly that you can scarcely see what you have begun to do, deepening your strokes little by little, and going over them repeatedly to make the shadows. Where you would make it darkest go over it many times; and, on the contrary, make but few touches on the lights. And you must be guided by the light of the sun, and the light of your eye, and your hand; and without these three things you can do nothing properly. Contrive always when you draw that the light is softened, and that the sun strikes on your left hand; and in this manner you should begin to practise drawing only a short time every day, that you may not become vexed or weary.

CHAP. 9.—*How to arrange the light, and give chiaro-scuro and proper relief to your figures.*

If by accident it should happen, that when drawing or copying in chapels, or colouring in other unfavourable places, you cannot have the light on your left hand, or in your usual manner, be sure to give relief to your figures or design according to the arrangement of the windows which you find in these places, which have to give you light, and thus accommodating yourself to the light on which side soever it may be, give the proper lights and shadows. Or if it were to happen that the light should enter or shine right opposite or

full in your face, make your lights and shades accordingly; or if the light should be favourable at a window larger than the others in the above-mentioned places, adopt always the best light, and try to understand and follow it carefully, because, wanting this, your work would be without relief, a foolish thing, without mastery.

CHAP. IO.—*The manner and process of drawing on parchment and on paper, and how to shade with water-colours.*

Let us return to our subject. You may also draw upon parchment, and paper made of cotton. On parchment you may draw or sketch with the above-named style, first rubbing and spreading some of the powdered bone-dust over the parchment, scattered thinly and brushed off with a hare's foot, and powdered like writing-powder or resin.¹

If you like, when you have completed your drawing with the style, in order to make it clearer, you may fix the outlines and necessary touches with ink, then shade the folds with water-colour made of ink, that is, water about as much as a nutshell will hold, into which are put two drops of ink, and shade with a brush made of tails of the minever, blunt and nearly always dry.

¹ *i.e.* pounce, or powdered resin.

12 The Book of the Art

And then, according to the shades required, you must blacken the water with a few drops of ink. In the same manner you may shade with colours and clothlet tints¹ (*pezzuole*), such as miniature painters use; mix your colours with gum, or with the clear or albumen of an egg well beaten and liquefied.

CHAP. 11.—*How to draw with a leaden style.*

It is possible also to draw on parchment without bone-dust with a style of lead; that is, with two parts of lead, and one of tin, well beaten with a hammer.

CHAP. 12.—*How, when drawing with a leaden style, an error may be corrected.*

You may draw on paper also with the above-mentioned leaden style, either with or without bone-dust; and if at any time you make an error, or you wish to remove any marks made by the leaden style, take a little crumb of bread, rub it over the paper, and efface whatever you please. And on this kind of paper, in the same manner, you may shade with ink, or colours, or clothlet tints (*pezzuole*), with the before-mentioned vehicle.

¹ Bits of rag were stained with transparent pigments to be extracted in water as required.

CHAP. 13.—*How drawing with the pen should be practised.*

When you have practised drawing in this manner one year, either more or less, according to the pleasure you take in it, you may sometimes draw on paper with a fine-pointed pen. Draw lightly, working up your lights and your half-lights and your shades gradually, retouching many lines with your pen. And if you would have your drawing more highly finished use a little water-colour, as before directed, with a blunt-pointed minever brush. Do you know what will be the consequence of this practice of drawing with the pen? It will make you expert, skilful, and capable of making original designs.

CHAP. 14.—*How to make a pen for the purpose of drawing.*

If you would know how to make a pen of a goose-quill, take a firm quill, place it on the two fingers of the left hand, the under side of the quill upwards; take a good sharp penknife, and cut away about the width of a finger along the length of the quill, and cut it drawing the penknife towards you, taking care that the cut should be even and in the middle of the pen. Then replace the penknife on one of the edges of this pen, that is, on the left side which is opposite to you,

14 The Book of the Art

and pare downwards, making it thinner towards the point, and cut round the other edge of the pen and bring it to the same point. Turn the pen over, put it on the thumb-nail of the left hand, and gently scrape and nib the point, and make it either broad or fine as you require for drawing or writing.

CHAP. 15.—*How to draw on tinted paper.*

In order to proceed gradually and begin at the very beginning, and as it were at the foundation and threshold of colouring, you must learn another method of drawing besides those of which we have previously been speaking; and this is called, drawing on tinted paper—either on parchment or paper. They are called tinted because the whole surface of either is coloured with the same tint. The tints may be either red, purple, green, azure, grey, flesh-colour, or any colour you please; they all require the same tempering and grinding, and may all be drawn upon in the same manner. It is true that green tints are the most beautiful and most frequently used, both for drawing on with shade-colours, and with white. Although I shall hereafter treat of grinding the colours, of their several natures and of the medium (*tempera*) they require, I must give you in short a quick method for your use in drawing and for tinting the paper.

CHAP. 16.—*How a green tint is made in drawing-paper, and how it is tempered.*

When you wish to tint goat-parchment or sheets of paper green, take about the size of half a walnut of verde-terra, and half the quantity of ochre; of stiff white lead half the quantity of the ochre, and about the size of a bean of bone-dust which I have taught you previously to prepare, and half the size of a bean of vermilion, and grind all these well together on a porphyry slab, with water from a well, or spring, or river: grind them as long as you can bear grinding—you cannot grind them too much; and the more you grind them, the more perfect the tint will be. Then temper these ingredients with glue (*colla*) of the following kind and strength: Take a piece of glue as sold by the apothecaries (not fish-glue), and put it in a pipkin to soak, in as much clean water as can be contained in two common drinking-glasses, for the space of six hours; then put the pipkin on a moderate fire, and skim it when it boils. When it has boiled a short time, and the glue is perfectly dissolved, strain it twice; then take a painter's vase, large enough to contain the colours you have ground, and add the glue to them till the colours flow well from the brush; then take the paper which you wish to tint, and with a hog's-bristle brush, rather large and soft, spread the colour immediately all over, with a light touch,

16 The Book of the Art

and the brush almost half-dry, first in one direction and then in the other, and so go over it four or five times until you see that the paper is tinted equally, with a space of time between each coat, that each one may dry, and if it gets dry or leathery with your tinting, it is a proof that the tempera is too strong ; therefore when you have gone over it the first time you must remedy this. How ? Add clean tepid water to it. When finished and quite dry, take a knife and rub it lightly over the paper, to remove any little grain of roughness.

CHAP. 17.—*How to tint parchment (carta di cavretto) and to burnish it.*

To draw on parchment, you must first soak it in spring or well water till it become soft. Fasten it tight with small nails over a plank, as you would stretch the parchment over a drum, and tint it as before directed. Should it happen that the parchment or paper is not smooth enough for the purpose, put it on a plank of walnut-wood, or on an even and well-polished stone. Then put a very clean sheet of paper upon that which you have tinted ; and with the stone with which you burnish gold, burnish it with good strength of hand, and by this means it will become very soft and smooth. True it is that some persons like to burnish on the tinted parchment itself, so that

the burnishing stone should touch its surface and give it a little lustre: do which you please, but the first mode is the best. The reason is, that the lustre given to the tinted paper, by rubbing it with the burnishing stone, takes away the lustre of the style in drawing: and besides, the water-colour, when applied, does not look so soft and clear as when the first process is used. *Sit nihil hominibus (sed nihil ominus in the MS.); do as you please.*

CHAP. 18.—*How to tint paper of a morella or purple colour.*

Now learn how to make these tints. To tint paper morella or purple colour, take, for the number of sheets I have mentioned above,¹ half an ounce of white lead and the size of a bean of lapis amatisto,² and grind them as well together as you can; they cannot be spoilt by too much grinding, but on the contrary will be improved. Temper the colour in the usual manner.

CHAP. 19.—*How to tint paper with indigo.*

For the above mentioned number of sheets take half an ounce of white lead (*biacca*), and the size of

¹ Cennino has omitted to mention any number.

² Red hæmatite, perhaps, resembling our Indian red.

two beans of indigo and grind them well together; much grinding will not spoil the tint. Temper and use in the same manner as before.

CHAP. 20.—*To tint paper a reddish or peach-colour.*

If you would tint paper of a reddish colour for the same number of sheets, take half an ounce of verde-terra, the size of two beans of stiff white lead, and the size of a bean of light sinopia (red earth), grind them in the usual manner, and temper with your size or tempera.

CHAP. 21.—*To tint paper of a flesh-colour.*

To make a good flesh-coloured tint, take for the same number of sheets of paper, half an ounce of white lead, and less than the size of a bean of vermilion. These must be all ground together. Temper in the usual manner as above.

CHAP. 22.—*To make grey tints on paper.*

Grey tints are made in this manner. Take a quarter (? of an ounce) of coarse white lead, the size of a bean of light ochre, less than half the size of a bean of black; grind these well together

in the usual manner. Temper as I have before directed, putting always to each the size of a bean at least of burnt bones, and these directions are sufficient for the different sorts of tinted paper.

CHAP. 23.—*In what manner you may take the outline of a beautiful face or design on transparent paper (carta lucida).*¹

You must be told that there is still another kind of paper, called transparent, which may be very useful to you in copying a head, or a figure, or a half-length figure, from the work of a great master. If you wish to take a correct outline from paper or panel or wall for yourself, put the transparent paper over the figure or design, fastening it lightly at the four corners with a piece of red or green wax. The figure or design will be immediately visible through the transparent paper, so that you can see it clearly. Then take either a pen with a fine nib, or a small minever brush, and with ink trace the outlines and extremities of the design under it. Then taking away the paper, you may touch the lights and relievos as you please.

¹ In the *Hermeneia*, very detailed directions are given for making tracings from pictures.

CHAP. 24.—*The first mode of making transparent paper.*

If you need this transparent paper, and cannot find it ready made, make it in the following manner. Take a skin of parchment, give it to a parchment-maker and make him scrape it till it scarcely holds together, and let him take care to scrape it evenly. It is of itself transparent. If you would have it more clear, take linseed oil, very clear and fine, and rub it over with a piece of cotton dipped in this oil; let it dry for the space of several days, and it will be perfect and good.

CHAP. 25.—*The second mode of making transparent paper with glue.*

If you would prepare this transparent paper in another manner, provide a slab of marble or porphyry well polished. Then take fish-glue and pieces of glue (*colla di spicchi*) sold by the apothecaries, put them to soften in clean water; and to six pieces put a porringer full of clean water. Then make it boil; and when boiled, strain it two or three times. Then take some of this dissolved and strained glue, and when cool, with a brush, as in tinting paper, pass all over the slab, which must be clean. The stone should be first greased with olive oil; and

when the glue upon the slab is dry, take the point of a knife and begin somewhere to loosen the glue from the slab, so that you can with your hand take off this skin or paper you have made in this way. With great care you may detach this glue safely from the stone like a sheet of paper. Or, before you detach this skin of glue from the stone, take linseed oil boiled in the manner I shall direct when speaking of mordants, and with a soft brush go once over it; let it dry for two or three days, and it will be very transparent.

CHAP. 26.—*How transparent paper (carta lucida) may be made of cotton paper.*

This same *carta lucida* of which we have spoken, may also be made of cotton paper. The paper must be thin, even, and very white; oil it with linseed oil as before directed. It will be transparent and is good.

CHAP. 27.—*How you should endeavour to copy and design, following a master as much as you can.*

It is now needful that you should advance further in order to follow the path of this science. You have made tinted paper. It is necessary for you to keep to this method. Having practised drawing a sufficient time on tablets as I have before directed,

always take pains in drawing the best subjects which you can find, done by the hand of great masters. If you live in a place where there are many good masters, so much the better for you. But I counsel you always to choose the best and most famous; and daily following him, it will be against nature if you do not come close to his manner and style; for if you copy to-day from this master and to-morrow from the other, you will not acquire the manner of either; and you will necessarily become fantastic, for each manner will distract your mind. You will study this manner to-day and that to-morrow, and you will get neither perfectly; but if you continually follow the method of one master, your intellect must be very dull indeed if it gets no food. And it will happen that if nature has bestowed on you any invention, you will acquire a manner of your own, which cannot be other than good, because your hand and your understanding being always accustomed to gather the flowers, would scarcely know how to take thorns.

CHAP. 28.—*How, more than from the masters, you should draw continually from nature.*

Remember that the most perfect guide that you can have and the best course (helm), is the triumphal gateway of drawing from nature: it is before all

other example, and with a bold heart you may always trust to it, especially when you begin to have some judgment in design. And continue always, and without fail, to draw something every day, not too little to be enough, and it will do you excellent service.

CHAP. 29.—*How you should regulate your manner of living so as to preserve decorum, and keep your hand in proper condition ; and what company you should frequent ; and how you should select and draw a figure in relief.*¹

Your manner of living should always be regulated as if you were studying theology, philosophy, or any other science ; that is to say, eating and drinking temperately at least twice a day, using light and good food, and but little wine ; sparing and reserving your hand, saving it from fatigue as throwing stones or iron bars, and many other things which are injurious to the hand, wearying it. There is still another cause, the occurrence of which may render your hand so unsteady that it will tremble and flutter more than leaves shaken by the wind, and this is frequenting too much the company of ladies.—Let us return to our subject. Make a pocket of sheets of paper glued together, or of light wood,

¹ Lionardo in his treatise advises solitude to painters.

24 The Book of the Art

square-shaped, large enough to hold a *foglio reale* (royal sheet), that is, half one, and also serve for a desk to draw on. Then always retire alone, or with companions who are inclined to do as you do, and are not disposed to hinder your work; and the more intellectual these companions are, the better will it be for you. When you are in churches or chapels, and you begin to draw, consider first what space, or history, or figures you wish to sketch, and remark where the shades, middle tints, and lights fall; and I must tell you here to shade with ink and water, to leave the ground of the panel for the middle tints; and to use white for the lights.

CHAP. 30.—*In what manner you should begin to draw on paper with charcoal, and proportion the figure, and fix your drawing with a silver style.*

Procure some fine charcoal, cut to a point, like a pen or style, and the first measure that you take in drawing let it be one of the three parts into which the face is divided, namely, the head, hair, and forehead, the nose, and the chin with the mouth. And taking one of these three parts, it is a guide to you for the whole figure, for the buildings, from one figure to another, and is a perfect guide if you use your intelligence in knowing how to follow these

measures; and this is done because the historical painting, or the figure you copy, may be of large dimensions, and you may be unable to reach with the hand to measure it. You must make use of your understanding, and in this way you will discover truth. If you have not proportioned your drawing successfully by the first touches, take a feather, either of a hen or goose, as may be, and with the feather part of it rub and clean away the charcoal from what you have drawn, and the design will be effaced. Begin again from that part the proportions of which appear to agree with the original; and when you see that it is about correct, take the silver style, and pick out the outlines and extremities of your design, and the main folds. When you have done this, with the feather part of the quill or fluffy feather (*penna pelosa*) remove the charcoal, and your drawing will be fixed by the style.

CHAP. 31.—*How to draw and shade on tinted paper in water-colours, and heighten the lights with white.*

When you have gained the power in the hand of shading, take a brush, rather blunt, and with water and ink in a small vase go over the main folds, and then soften the dark of the fold according to its direction. This water-colour must be almost

like slightly tinted water, and the brush must be almost dry. Do not hurry, but shade by degrees, always returning with your pencil to the darkest parts. Do you know what will happen from this proceeding? If the water has but little colour, and you take pleasure in shading, and do not hurry yourself, your shades will at last appear soft, like smoke. Always remember to keep the brush flat. When you can shade well, take a drop or two of ink, add it to the water-colour, and stir it well; and then in the same manner find the depths of these folds, seeking the very bottom of them—always remembering, while shading, your three divisions: the first consists of shades, the second of the colour of the ground, and the third of the lights. When you have done this, take a little white lead well ground with gum-arabic—hereafter I shall treat of the manner in which this gum should be liquefied and dissolved, and I shall also treat of all kinds of vehicles; a very little white will be sufficient. Put some clean water in a little vase, dip your brush into it, and rub it on the prepared white lead, particularly if it is dry; then hold it on the ball of your thumb, and, squeezing the brush, discharge the colour from it, so that you leave it almost dry. Begin by rubbing the brush flat over those places where there ought to be lights and relievos, and go many times over them, but with discretion; then for the extreme relievos and high lights,

take a pointed brush, and touch them with the point of the brush dipped in white. Take a small brush, and with pure ink draw the folds and outlines, noses, eyes, and the divisions between the locks of the hair, and beard.

CHAP. 32.—*How you may draw with white in water-colour, as well as shade with water and ink.*

I advise also, when you are more practised, that you endeavour to draw with white in water-colour as you did with ink and water. Take white lead ground with water, and temper it with the yolk of an egg, and shade (wash?) softly as you did with the ink water-colours; but it is more difficult and requires more practice. Both methods are called drawing on tinted paper, and they will lead to the art of colouring. Practise as frequently as you can, for it is the whole of your education; attend closely, and with great diligence, delight, and pleasure, to these studies.

CHAP. 33.—*In what manner good and fine charcoal crayons may be made.*

Before we proceed further, I will teach you how to make crayons of charcoal. Take some slips of willow, dry and smooth, and cut them into pieces as long as

28 The Book of the Art

the palm of the hand or the little finger; then divide them like matches, and fasten them together like a bundle of matches; but first polish and sharpen them on each side as if they were tin. Thus, laying them in bundles, bind each bundle in three places, that is, by the middle and each end, with a fine copper or iron wire; then take a new pipkin, and fill the pipkin with them; put on an earthen cover, and lute it round with chalk or clay, so that no air can enter. Then go to the baker in the evening, when he has left off work, that is, when he has finished baking the bread, and put this pipkin in the oven, and let it remain till morning; then look whether the crayons are well burnt and black. If they are not black enough, let them remain till they are so. How to see if they are right? Take one of the crayons and draw with it, either on paper (parchment?) or tinted paper, or on a primed panel. If the crayon works freely it will do; if it is too much baked it will not keep together in drawing, but will split to pieces. I will tell you another way of making these crayons. Take a small baking-pan, covered as above mentioned; put it at night under the fire, cover the fire well with ashes, and go to bed. In the morning the crayons will be done. And in the same manner you may make small or large crayons as you please, and there are no better crayons in the world.

CHAP. 34.—*Of a stone which is of the nature of charcoal for drawing.*

I have found that a certain black stone which comes from Piedmont is good for drawing; it is a soft stone and very black; it can be sharpened with a knife, for it is soft. You can bring it to the same perfection. Draw with it what you please.

CHAP. 35.—*Returning to the grinding of the colours.*

In order that step by step we may attain to the light of art, we come to the grinding of the colours, and to instructing you which are fine or coarse or impure; that some require but little, others much grinding; some demand one vehicle, some another; and how they differ in colour, as in the manner of tempering them and grinding them.

CHAP. 36.—*What are natural colours (pigments), and how to grind black.*

You must know that there are seven natural colours; namely, four which are of the nature of earths, as black, red, yellow, and green; three are natural colours, but require the assistance of art, as white, ultramarine blue, or della magna blue, and

30 The Book of the Art

Naples yellow. We will not proceed further, but return to the black pigment. To grind it properly, procure a slab of porphyry which is hard and strong, for there are many kinds of stones for grinding colours, as porphyry, serpentine, and marble. Serpentine is a soft stone, and is not good; marble is worse, that is, softer; porphyry is the best of all; and if you procure a slab very pale-coloured, it will be best. One of those which are not very much polished is also best. It should be about half a braccio square.¹ Take another stone to hold in the hand, also of porphyry, flat underneath and raised above in the shape of a porringer and half the size, of such a form that the hand may be mistress of it and move and guide it at pleasure. Then take some of the black (or of any other colour), about the size of a walnut, and put it on the slab, and with that stone which you hold in your hand break the pigment into small pieces. Put some clean water, either from a river, a fountain, or a well, to the colour, and grind it well for the space of half-an-hour, or an hour, or as long as you please; but know, that if you were to grind it for a year, so much the blacker and better would be the colour. Then take a flat piece of fine-grained wood, three fingers wide, part of which is shaped like the blade of a knife, and with this blade

¹ A grinding stone of $\frac{1}{2}$ braccio, that is, under a foot, is small. A slab of plate-glass answers very well, and a glass muller.

scrape the stone and collect the colour neatly; keep it liquid, and not too dry, that it may flow well on the stone, and that you may be able to grind it thoroughly, and collect it all. Put it then into a small vase, and pour clean water on it till the vase is full; and in this manner keep it always soft, and well covered from the dust, and from all other harm, that is, in a little box suitable for holding several vessels containing liquid.

CHAP. 37.—*How to make black in several ways.*

Remember that there are several black pigments, one of which is a soft black stone, and the colour is opaque (*grasso*). I must inform you that transparent colours are better than those which have much body, except that in laying on gold, the richer (*piu-grasso*) the bole or terra-verde, when you have pictures to gild, the better will be the gold. Let us leave this subject. Another black is made of the young shoots of the vine, which are to be burnt, and when burnt, thrown into water, and quenched, and then ground like other black pigments. This colour is black and transparent (*magro*), and it is one of the most perfect pigments we use. Another black is made of the shells of almonds, or of peach-stones; this also makes a perfect and fine black. Another black is made in this manner: Take a lampful of linseed oil, fill the lamp

with this oil, light the lamp, and put it under a clean baking-dish, so that the flame of the lamp shall be about the distance of two or three fingers from the dish, and the smoke which comes from the flame shall strike against the bottom of the dish; it will get covered thick with smoke. Collect the smoke together; wait a little; take the baking-dish, and sweep off the smoke which is the pigment into paper, or into some vessel; it does not require grinding, because it is already a very fine powder. Thus refill the lamp several times with the oil, put it back under the dish, and make in this manner as much as you require.

CHAP. 38.—*Of the nature of a red pigment called sinopia.*

There is a natural red pigment, which is called sinopia or porphyry. The colour is naturally transparent (*magro*) and drying. It bears grinding well, and the more it is ground, the finer it is. It is good for painting either on panels or walls, in fresco or in secco. These terms, 'fresco' and 'secco,' shall be explained to you when I treat of painting on walls. And this is enough about the first kind of red.

CHAP. 39.—*How to make the red pigment which is called cinabrese, for the flesh-colours on walls, and its nature.*

There is a red colour called light cinabrese, and I do not know that this colour is used anywhere but in Florence; it is perfect for flesh-painting, for making the flesh of figures on walls, and works well in fresco. This colour is made of the finest and lightest sinopia which is to be found; it is mixed and ground with bianco sangiovanni, as it is called in Florence (a white made of a very white well-slaked lime). And when you have well ground together these two colours, that is, two parts of cinabrese, and the third lime-white, make them into cakes the size of half a walnut, and let them dry, and when you require some take what seems right. This colour will do you honour for painting faces, hands, and naked figures on walls, as I have said. And sometimes you may make with it beautiful draperies, which on walls look like cinnabar.

CHAP. 40.—*Of the properties of a red called cinnabar, and how it ought to be ground.*

There is a red colour called cinnabar, and this colour is made by a chemical process performed in an alembic, which I will leave alone, as it would

34 The Book of the Art

take too much time to put in my explanation each method and recipe. If you wish to fatigue yourself with it, you will find plenty of recipes, especially collecting them among the monks. But I advise you, that you may not lose your time in the many variations in the methods, to get what you want at the apothecary's and pay for it; and I will teach you how to buy it and to distinguish good cinnabar. Always purchase the whole cinnabar, unbroken and unground. The reason? Because it is often adulterated with minium (red lead) and with pounded brick-dust. Examine the whole lump of cinnabar, and at the top, where the veining¹ is most extensive and finest, it is the best. Put this then upon the slab above mentioned, grinding it with clean water as much as you can; if you were to grind it every day for twenty years, it would be but the better and more perfect. This pigment requires various temperas, according to the situation in which it is to be used; but of this I shall hereafter speak, and shall give you proper directions in a more fitting place. But bear in mind that it is not its nature to be exposed to the open air; it is more lasting on panels than on walls, because, by long exposure to the open air (*all' aria*) it becomes black when applied to walls.

¹ Or crystallisation, 'tiglio.'

CHAP. 41.—*Of the properties of a red which is called minium (red lead).*

There is a pigment called minium, which is artificially produced by chemistry. This pigment is only proper to be used in pictures (on panels), for if it is used on walls, on exposure to the open air it suddenly becomes black, and loses its colour.

CHAP. 42.—*Of the properties of a red called amatisto or amatito.*

There is a red colour called amatito. This is a natural colour, and is produced from a very hard and solid stone. It is so solid and perfect (flawless?) that tools and teeth are made of it to burnish gold on panels, which tools become of a colour very dark and perfect and as polished as a diamond. The pure stone is of a maroon or purple colour, and is crystallised (*ha un taglio*) like cinnabar. Break this stone in a bronze mortar, because if you were to break it upon the porphyry slab you might split it; and when you have broken it put a small quantity on the slab, and grind it well with clean water; and the more you grind it the better it will be, and the more perfect the colour. This pigment is proper for walls and for working in fresco; and it makes a colour such as cardinals wear, or a violet or lake colour. If you want to use it for other things, or with tempera, it is not good.

36 The Book of the Art

CHAP. 43.—*Of the nature of a red called dragon's blood.*

There is a red called dragon's blood. This colour is sometimes used on parchment (*carta*), in miniature painting. Let it alone, however, and be not too anxious for it; it is not of a nature to do you much credit.

CHAP. 44.—*Of the nature of a red pigment which is called lake.*

There is a red called lake, which is an artificially made pigment. There are many recipes for it; but I advise you pay your money and take the colour ready-made, out of regard to the skilled processes necessary; but be careful to distinguish the best, for there are many sorts of it. If the lake is made of the shreds of cloth, or stuffs, it is very beautiful to the eye; but beware of this, because it always retains some body by reason of the alum which it contains—is not durable, either tempered or not, and rapidly loses its colour. Be careful to shun this kind; but procure the lake which is obtained from gum, and is dry and transparent, and granular, so that it almost appears to be earth: it has a blood-red colour. This cannot be otherwise than good and perfect. Take this and grind it on the stone. Grind it with clean

water; it is good on panels. It is also used on walls with tempera, but the open air is destructive to it. Some there are who grind it in urine, but this is unpleasant, and soon becomes offensive.

CHAP. 45.—*Of the nature of a yellow colour which is called ochre.*

There is a natural yellow called ochre. This pigment is found in mountainous country, where there are veins of it like sulphur; where these veins exist are found sinopia, verde-terra, and other pigments. I found this ore, having been taken one day by my father, Andrea Cennini, to the territory of the Colle di Valdelsa, near the confines of Casole, on the outskirts of the wood of the commune of Colle, above a villa called Dometaria, and coming to a small valley, and into a very wild grotto, and digging with a spade, I saw veins of many colours, namely of ochre, light and dark sinopia, blue and white; and it seemed to be the greatest miracle in the world that white should come from veins in the earth; but I remember that I made a trial of this white and found it unctuous (*grasso*), and unfit for the colouring of flesh. There was also in this place a vein of a black colour; and these colours were as visible on the earth here as any marking in the face of a man or woman.

But let us return to the ochre-pigment. I went

38 The Book of the Art

with a knife seeking everywhere where the veins of this colour showed, and I assure you that I never met with more beautiful or perfect ochre. I agree that it does not show up as bright as Naples yellow, it is a little darker; but for hair and drapery, as I shall hereafter instruct you, I never found any colour better than this ochre. It is of two kinds, light and dark. Each colour requires to be ground in the same manner, with clean water; and grind them well, they will be all the better for it. You must know that this colour is of general usefulness, specially in fresco-painting, and with other mixtures. It is used, as I shall tell you hereafter, in painting flesh, in colouring landscapes, mountains, buildings, horses,¹ and in many other things. This colour is, in its nature, of good body (*grasso*).

CHAP. 46.—*Of the nature of a yellow called giallorino (Naples yellow).*

There is a yellow colour called giallorino, which is made artificially, and is very hard. It is as heavy as a stone, and hard to break. This colour is used in fresco, and is very everlasting, that is, on walls and on panels, with tempera. It must be ground, like the other colours, with clean water. It does not want to be much ground; and before you grind it, because

¹ Milanese corrects from *cavalleria* to *capelliera*, hair.

it is very troublesome to reduce to powder, it is better to break it in pieces in a bronze mortar, as I advised you to do with regard to the lapis amatisto. And when you have put it on your work, it is a yellow of a very lovely colour; so that with this colour, with other mixtures, as I will show you, is made beautiful verdure and grass-colour. I wish you to understand that this is a real stone, produced in mountainous volcanic districts; therefore, I say it is an artificial pigment, but not a chemical preparation.

CHAP. 47.—*Of the nature of a pigment called orpiment.*

There is a yellow pigment called orpiment. This is an artificial pigment, and a chemical preparation, and is very poisonous. It is a very lovely yellow, like gold in colour. It is not good for walls, neither in fresco nor with tempera, because by exposure to the open air it becomes black. It is very good for painting shields and lances. This colour, mixed with indigo, makes a green the colour of grass and herbage.

Sparrowhawks (*sparvieri*) are doctored with this pigment, in a certain illness which attacks them. It is the hardest colour to grind of any used in our art; therefore, when you are going to grind it, put the quantity you want on the stone, and with that stone which you hold in your hand, coax and press it between the stones, mixing with it a little crushed

40 The Book of the Art

glass, because the powdered glass draws the orpiment to the roughness of the stone. When you have broken it to piéçs, put clean water to it and grind it as much as you can,—and if you were to grind it for ten years, so much the better would it be. Beware of letting it soil your mouth, lest you harm yourself.

CHAP. 48.—*Of the nature of a yellow called risalgallo (realgar, or red orpiment).*

There is a yellow colour called risalgallo; this colour is very poisonous. It is not used by us except sometimes on panels. It cannot be mixed with any other colour. If you wish to grind it, do as I have before directed: it must be ground with a good deal of water; and guard your person from contact with it.

CHAP. 49.—*Of the nature of a yellow called zafferano (saffron-yellow).*

There is a yellow colour, made from a drug called saffron; you must put it into a piece of linen upon a hot stone or brick; get about half a glassful of strong lye, put the saffron in it and grind it on the stone. It will produce a beautiful colour for dyeing linen or cloth. It is good on parchment (*carta*). Do not expose it to the open air, for it soon loses its colour. And if you would make the most perfect colour

possible for grass, take a little verderame (verdigris) and some zafferano, that is, of three parts, one saffron, and the most beautiful green grass colour will result which can be made. Temper it with size as I have before directed.

CHAP. 50.—*Of the nature of a yellow called arzica.*¹

There is a yellow pigment called arzica, which is a chemical preparation and not much used. It is chiefly used by miniature-painters, and more by those of the neighbourhood of Florence than at any other place. It is a very delicate colour, not durable when exposed to the open air, is not proper for walls, but is good on panels; mixed with a little azzurro della magna and giallorino, it makes a beautiful green. It must be ground, like all other fine colours, with clean water.

CHAP. 51.—*Of the nature of a green called verde-terra.*

There is a natural green pigment which is an earth, and is called verde-terra. This colour has many uses. First, as it is a very full-bodied pigment, it is proper to use for faces, draperies, buildings, in fresco and secco, on walls, on panels, and wherever you please. Grind it as I have told you to grind

¹ Milanesi suggests that this is a vitreous yellow.

42 The Book of the Art

the other colours, with clean water; and the more you grind it, the better it is. And if you temper it in the same manner as I shall direct you to temper bole for putting on gold, you may in the same way lay on gold upon verde-terra. And know that the ancients were never accustomed to lay gold on panels, otherwise than with this verde-terra.

CHAP. 52.—*Of the nature of a green called verde-azzurro (malachite green or verditer).*

There is a green pigment which is partly natural, but requires artificial preparation. It is made of azzurro della magna. This is called verde-azzurro. Do not trouble yourself as to how it is made, but buy it ready-made. This colour is good in secco, tempered with yolk of egg, to paint trees and grass, and also for laying flat tints; and they lighten it with giallorino (Naples yellow). This colour is of itself coarse and sandy. For love of the azzurro grind it very little with a light hand, because, if it be too much ground, it will become a faded and ashen colour. It must be ground with clean water, and when you have ground it pour clean water into the vase on the colour, and stir both well together; then let it rest for an hour or two, or three; pour away the water, and the green will be most beautiful. Wash it in this manner two or three times, and it will be still finer.

CHAP. 53.—*How to make a green with orpiment and indigo.*

There is a green colour made of two parts of orpiment and one of indigo, and grind them well together with clean water. This colour is good for shields and lances, and it is also used for painting rooms in secco. It does not like any other tempera than glue (size).

CHAP. 54.—*How to make a green with verde-azzurro and Naples yellow (giallorino).*

There is a green colour made with verde-azzurro and giallorino. This is proper for walls and pictures (panels), and is tempered with the yolk of egg. If you would make the colour more beautiful, add to it a little arzica; also it is a beautiful colour, adding to it some azzurro della magna; pounding some wild plums and making verjuice (*agresto*), and of this putting four or six drops to the blue. It makes a beautiful green, but does not bear exposure to the open air. And in time the verjuice entirely disappears.

CHAP. 55.—*How to make a green with ultramarine blue.*

A green colour may be made of ultramarine and orpiment. These colours must be mixed with judgment. First take the orpiment, and then add the blue.

44 The Book of the Art

If you would have it incline to a light green, let the orpiment prevail; if to a dark green, let the blue prevail. This colour is proper for pictures (panels), but not for walls. Temper it with size.

CHAP. 56.—*Of the nature of a green called verdigris (verderame).*

There is a green pigment called verderame. It is sufficiently green of itself, and is an artificial chemical production, made of copper and vinegar. This colour is used on panels tempered with glue. Be careful never to put it near white lead, because these two colours are mortal enemies in everything. Grind it with vinegar, which it is its nature to retain; and it makes a green for grass most perfect and beautiful to the eye, but not durable. It is good on parchment, on paper, or on vellum, tempered with the yolk of an egg.

CHAP. 57.—*How make a green with verde-terra and biacca, or with bianco sangiovanni.*

There is a green the colour of sage, which is made by mixing biacca and terra-verde, for panels, tempered with the yolk of an egg; for walls in fresco, mix the verde-terra with bianco sangiovanni made of slaked white lime.

CHAP. 58.—*Of the nature of bianco sangiovanni (lime-white).*

There is a natural white pigment which, however, requires some preparation. It is prepared in this manner. Take very white slaked lime (*calcina sfiorata*); pulverise it, and put it into a little tub for the space of eight days, changing the water every day, and mixing the lime and water well together, in order that it may throw off all unctuous properties (*grassezza*). Then make it into small cakes, put them upon the roof of the house in the sun, and the older these cakes are, the whiter they become. If you wish to do it quickly and well, when the cakes are dry, grind them on your slab with water, and then make them into cakes and dry them again. Do this twice, and you will see what a perfect white it will become. This white must be ground with water, and thoroughly. It is good for working in fresco, that is, on walls without tempera; and without this colour you can do nothing,—I mean, you cannot paint flesh, or make tints of the other colours which are necessary in painting on walls, namely, in fresco; and it never requires any tempera.

CHAP. 59.—*Of the nature of biacca (white lead).*

There is a white pigment prepared chemically from lead, which is called biacca. This white is strong

46 The Book of the Art

and brilliant (*focosa*), and is in cakes of the shape of drinking-glasses. To know the best sort, always select that kind the top of which is in the form of a cup. The more this colour is ground, the more perfect it is; it is proper for pictures. It is certainly used on walls; but beware of it nevertheless, for in time it becomes black. Grind it with water; it will bear any tempera, and will enable you to make your colours lighter in pictures (on panels) in the same manner as the other white does on walls.

CHAP. 60.—*Of the nature of azzurro della magna (blue verditer or lazulite).*

There is a natural pigment of a blue colour, which is found in and around veins of silver. A great quantity is produced in Germany and also in Siena, but it must be perfected artificially by the pastello. When you are going to lay on grounds with this blue, you must grind it very little at a time and carefully with water, for it has a horror of the grinding-slab. If you would use it for draperies, or to make greens, as I have told you before, you must grind it more. This pigment is good on walls, in secco, and on pictures (panels); it bears a tempera of yolk of egg, glue, or whatever you please.

CHAP. 61.—*To imitate with other colours azzurro della magna.*

To make a light blue like azzurro, take indaco baccadeo (indigo from Bagdad) and grind it very fine, with water; and for pictures, mix it with a little biacca; and for walls, with a little bianco sangiovanni. It becomes like azzurro, and must be tempered with glue.

CHAP. 62.—*Of the nature of azzurro oltre marino (ultramarine blue), and how it is prepared.*

Ultramarine blue is a colour noble, beautiful, and perfect beyond all other colours, and there is nothing that could be said of it but it will still exceed this (praise). On account of its great excellence, I shall speak of it at length, and give you full directions for preparing it; and you must pay great attention to them, that you may gain honour and service from them. And with this colour, together with gold (which adorns all the works of our art) let everything be resplendent, whether on walls or panels.

First take some lapis lazuli; and if you would know how to distinguish the best stones, take those which contain most of the blue colour, for it is mixed with what is like ashes. That which contains least of this ash pigment is the best; but be careful that you

do not mistake for it azzurro della magna, which is as beautiful to the eye as enamel.

Pound it in a covered bronze mortar, that the powder may not fly away ; then put it on your slab of porphyry, and grind it without water ; afterwards take a covered strainer like that used by the druggists for sifting drugs (spices), and sift it and pound again as much as is required. But bear in mind that though the more you grind, the more finely powdered the azzurro will be, yet it will not be so beautiful and rich and deep in colour ; and that the finely ground sort is fit for miniature-painters, and for draperies inclining to white. When the powder is prepared, procure from the druggist, six ounces of resin of the pine, three ounces of mastic, and three ounces of new wax to each pound of lapis lazuli. Put all these ingredients into a new pipkin and melt them together. Then take a piece of white linen and strain these things into a glazed basin. Then take a pound of the powder of lapis lazuli ; mix it all well together into a paste, and that you may be able to handle the paste, take linseed oil, and keep your hands always well anointed with this oil. This paste must be kept at least three days and three nights, kneading it a little every day ; and remember that you may keep it for fifteen days or a month, or as long as you please. When you would extract the azure from the paste, proceed thus. Make two sticks of strong wood, neither too thick nor too

thin, about a foot long; let them be well rounded at each end and well polished (smoothed). Then, your paste being in the glazed basin into which you first put it, add to it a porringerful of lye, moderately warm; and with these two sticks, one in each hand, turn and squeeze and knead the paste thoroughly, exactly in the manner that you would knead bread. When you see that the lye is thoroughly blue, pour it out into a glazed basin; take the same quantity of fresh lye, pour it over the paste, and work it with the sticks as before. When this lye is very blue, pour it into another glazed basin, and continue to do so for several days, until the paste no longer tinges the lye. Then throw it away, it is good for nothing. Range all the basins before you on a table in order, that is to say, the first, second, third, and fourth; then beginning at the first, with your hand stir up the lye with the azure, which by its weight will have sunk to the bottom, and then you will know the depth of colour of the azure. Consider how many shades of the azure you will have, whether three, or four, or six, or what number you please, always remembering that the first-drawn extracts are the best, as the first basin is better than the second. And if you have eighteen basins of extract, and you wish to make three shades of azure, take the contents of six basins and mix them together; that will be one shade. Proceed in the same manner with the others. But remember that if you have good

50 The Book of the Art

lapis lazuli, the azure from the first two extracts is worth eight ducats the ounce. The last two extracts are worse than ashes—may your eyes therefore be experienced, so as not to spoil the good azure by mixing it with the bad; and each day remove the lye that the azure may dry. When it is quite dry, according to the sorts you have, put it into skins, bladders, or purses, as may be most convenient, and take notice that if the lapis lazuli should not be very good, or if after having ground it the colour were not to turn out deep (*violante*) enough, I will tell you how to give it a little colour. Take a little pounded kermes lake (*grana*) and a little verzino, but mind the verzino is grated or scraped with glass; and then boil them together with lye or a little roche alum. And when they boil, and you see that the colour is a perfect crimson, before you have withdrawn the azure from the porringer, but well dried from lye, add to it a little of this lake and verzino, and with your finger mix everything well together; and let them remain till dried, without sun, or fire, or wind. When dry, put it into a skin or purse, and rejoice in it, for it is good and perfect. And bear in mind that it is a rare gift to know how to make it well. You must know also that it is rather the art of maidens than of men to make it, because they remain continually in the house, and are more patient and their hands are more delicate. But beware of old women. When you

would use this azure, take as much as you want: and if you are going to work on light dresses, it must be ground a little on your usual stone. And if you want it for laying grounds, it must be very little worked on the stone and always with very clear water, the stone being well washed and clean. And if the azure should get soiled in any way, take a little lye or clean water, and put it into the vase, and stir them well together, changing it two or three times, when the blue will be quite clean. I shall not treat of its tempera, because I shall hereafter describe all the temperas proper for every colour to be used on pictures, on walls, on iron, on paper, on stone, or on glass.

CHAP. 63.—*Showing that it is necessary to know how to make brushes.*

As I have told you the names of all the colours individually which are used with brushes, and how they are ground, which colours must always be kept in a box well covered, and must be prevented from hardening by being kept wet with water (*col becco sempre in molle, e bagnati*), I will now instruct you how to use them both with tempera and without. But you must first know how to make use of them, and this you cannot do without brushes. Therefore we will leave these subjects, while I teach you how to make the brushes, which you are to do in the following manner.

52 The Book of the Art

CHAP. 64.—*How minever brushes are made.*¹

In painting, two kinds of brushes are necessary, namely, minever and hog's bristles. Those of minever are made in the following manner: Take the tails of the minever, for no others will do, and these tails must be baked and not raw. The furriers will tell you so. From the tip of such a tail draw the longest hairs, and collect the tips of many tails, so that from six or eight points you may make a soft pencil fit for laying gold on pictures, that is to say, to wet it with in the manner that I shall direct hereafter. Let us return now to the tail, which you are to take in your hand, and select the straightest and stiffest hairs from the middle of the tail; gradually make them into small bundles; soak them in a glass of clear water, then press and squeeze each bundle with the fingers. Then cut them with scissors; and when you have made many bundles, tie them together any thickness you please for pencils, so that they can be put into the quill of a vulture, of a goose, of a hen, or of a dove. When you have made them in this manner, laying the points very even, take waxed thread or silk, and with two knots fasten them well together, each sort by itself, the size you would have

¹ We may be quite contented not to have to make brushes for ourselves. The monks of Mount Athos complained very much of their home-made ones (Didron). Minever comes from old French *menu vair*, *var*, or *vair*, meaning ermine. Minever means mixed or spotted fur, *i.e.* the grey squirrel.

your brushes. Then take a quill, of a size corresponding to that of the bundle of hairs, and cut off the end of the quill, and put the bundle of hairs into the quill, and take care to squeeze in as many as you can, so that the brush may be stiff, for the firmer and shorter it is the better, and the more delicate the work it can do. Then make a small stick of maple, larch, or chestnut, or any other good wood; make it smooth and clean, scrape it into the form of a spindle, of such size that it shall fit tightly into the quill, and be about a span long: and this is the way to make brushes of minever. It is true that minever brushes are of various kinds; for instance, some are proper for laying on gold, some for putting on flat washes, which require to be blunted a little with the scissors, and rubbed upon the porphyry stone to soften them a little. Some brushes should have a perfect point for drawing outlines, and some must be very small and fine, for certain very minute works and figures.

CHAP. 65.—*In what manner brushes of hog's bristles are to be made.*

Hog's-bristle brushes are made in this manner. First take bristles from a white pig, which are better than black ones (but mind they are from the domestic pig), and make them into a large brush in which you

54 The Book of the Art

must put a pound of bristles, and bind them to a large stick with a knot of . . .¹ Such brushes must be softened by whitening walls and washing those which are to be covered with mortar.² Afterwards unfasten this brush, and make the bristles up into other brushes of all sorts. Let some of them be of the kind which are called blunt brushes (*pennelli mozzati*), in which the hairs are all of equal length; and some should be pointed, and you must have them of all sizes. Then make sticks of the wood formerly mentioned, and bind each bundle with a double waxed thread. Introduce the point of the stick into the bundle of bristles, and bind it evenly half the length of the bristles, and then along upon the stick, and finish all the others in the same manner.

CHAP. 66.—*How to preserve the tails of the minever from being moth-eaten.*

If you would preserve the tails of the minever so that they should not be moth-eaten, and the hairs should not fall off, steep them in kneaded clay or chalk, stick them tight into it, hang them up and let them remain so. When you would use them, or make them into brushes, wash them well with clean water.

¹ Word in MS. is defaced.

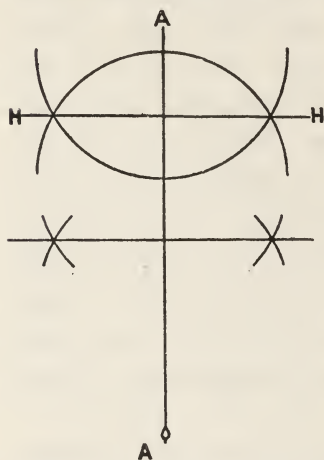
² This is a good hint. It is impossible to ground with a new brush, but the effect of time and use may be partially counterfeited by rubbing the tips down on sand-paper.

CHAP. 67.—*The manner of painting on walls, that is, in fresco, and of colouring or painting the flesh of the faces of young persons.*

In the name of the most Holy Trinity, I will now put you to colouring. I begin first with painting on walls, and shall teach you step by step the manner in which you ought to proceed. When you are going to paint on walls, which is the most delightful and charming kind of work that there can be, procure, in the first place, lime and sand, both of them well sifted. If the lime is very rich and fresh, it will require two parts of sand, the third of lime. Grind them well together with water, and grind enough to last you fifteen or twenty days. Let it rest for some days till it be quite slaked; for if any heat remains in it, it cracks the plaster (*intonaco*). When you are going to plaster, first sweep the wall, and wet it well—you cannot wet it too much; and take the well-stirred lime, a trowelful at a time, and spread it over once or twice, till the *intonaco* becomes quite even on the wall. Afterwards, when you are going to work, remember to make the surface of the mortar quite rough (*bene arricciato*) with a good tooth (*rasposo*). Then, according to the subject or figures you have to make, if the *intonaco* is dry, take some charcoal, and design and compose, and take every measurement carefully, first striking one

56 The Book of the Art

line, taking the centre of the space, and another for the horizon.¹ The perpendicular line by means of which the horizontal one is obtained must be made with a plumb-line. Then put one foot of the large compasses on the top of this line. Turn the compasses half round on the



compasses half round on the under side ; then put the leg of the compasses on the point of intersection of these two lines² and make the other half-circle above, and you will always find a cross on your right hand by the lines intersecting each other. Do the same on the left hand, which will give you two

crosses, and the line between will be exactly level.³ Then draw with charcoal, as I have before directed you, historical pieces and figures, and arrange your spaces always equal.⁴ Next take a small and pointed

¹ The Italian implies that this should be done with a stretched string coloured with powder, which, being struck, marks the wall.

² The perpendicular and the half-circle.

³ This diagram has been inserted to explain Cennino's meaning. AA is the plumb-line, HH the horizon line obtained by the intersecting circles.

⁴ Probably meaning to balance and correspond in size and composition,

bristle-brush, with a little ochre without tempera, as liquid as water, and continue to draw your figures, shading them as you did with water-colours when I taught you to draw. Afterwards take a bunch of feathers and thoroughly brush away the charcoal.

Then take a little sinopia without tempera, and with a finely pointed brush mark out the nose, eyes, hair, and all the extremities and outlines of the figures, and let these figures be correctly set out in every measurement which helps you to realise and project the figures which you have to paint. Then make your fringes (or ornaments, *fregi*) and accessories as you please. Take some of the above-mentioned lime; stir it well with a trowel till it is like the consistence of ointment. Then consider how much you can paint in a day; for whatever you cover with the plaster you must finish the same day. Sometimes in winter, in damp weather, working on a stone wall, the plaster remains fresh till the next day; but if you can help it do not delay, because when painting in fresco, that which is finished in one day is the firmest and best, and is the most beautiful work. Then spread over a coat of thin intonaco, and not too much, first wetting the old intonaco. Next take your large hog's-hair brush in your hand, steep it in clean water, beat it and wet your plaster with it, and then with a slip of wood as wide as the palm of your hand, rub round and

58 The Book of the Art

round over the wetted intonaco so as to remove the lime where you have put too much, and put more where there is not enough, and thus make your plaster quite smooth. Then wet the plaster with the same brush if necessary, and with the point of the trowel, which must be very clean and smooth, rub all over the intonaco. Then place your plumb-line as usual, and measure as you did on the underlying intonaco. Let us suppose that you can paint in one day the head only of a young male or female saint, such as that of our most holy Lady. Having thus smoothed the lime of your intonaco, procure a glazed vessel; the vessels should be all glazed and shaped like drinking or beer glasses, with a good heavy bottom that they may stand firmly, and not spill the colours. Take as much as a bean of dark ochre (for there are two kinds of ochre, light and dark); and if you have no dark ochre, take light ochre ground very fine; put it into your vase, and take a little black the size of a lentil, mix it with the ochre; take a little bianco sangiovanni (lime-white) as much as the third of a bean, and as much light cinabrese as will lie on the point of a pen-knife; mix all these colours thoroughly together, and make them flowing and liquid with water, without tempera. Make a sharp brush of fine soft bristles, which may be introduced into the quill of a goose, and with this brush indicate with proper

expression the face you are going to paint (remembering that the face is divided into three parts, namely, the forehead, the nose, and the chin, with the mouth), and with your brush nearly dry, put on this colour, little by little, which is called in Florence verdaccio, and in Siena Bazzèo.¹ When you have sketched out the form of the face, if the proportions or any other thing should displease you, with a large brush steeped in water, by rubbing over the intonaco, you can efface and repair what you have done. Then take a little verde-terra, very liquid, in another vase, and with a hog's-bristle brush, without a point, squeezed with the fingers and thumb of the left hand, begin to shade under the chin, and all those parts of the face which should be darkest—under the lips, the corners of the mouth, under the nose, and under the eyebrows, making the shade darker near the nose, a little on the edge of the eye towards the ear; and in the same manner making out with judgment (*sentimento*) the whole face and hands, which are hereafter to be coloured with flesh-colour. Next take a pointed minever brush, and strengthen all the outlines of the nose, eyes, lips, and ears, with the verdaccio. There are some masters who now, when the face is advanced thus far, take a little bianco sangiovanni

¹ This solitary reference to Siena is rather remarkable, but it may perhaps be connected with Vasari's statement that the MS. of the *Trattato* he had seen belonged to a Sienese goldsmith.

60 The Book of the Art

tempered with water, and seek out the high lights and reliefs in proper order; then give the rosy colours to the lips and cheeks; then wash over the whole with the flesh-colours very liquid with water, and the colouring is done. It is a good plan to retouch afterwards the high lights with a little white. Some wash over the whole face with the flesh-colour first; they go picking out with a little verdaccio and flesh-colour, retouching with a little flesh-colour, and the work is finished. This plan is adopted by those only who know but little of the art; but do you follow the method of colouring which I shall point out to you, because Giotto the great master followed it. He had Taddeo Gaddi the Florentine for his disciple for four-and-twenty years, who was his godson. Taddeo had Agnolo his son; Agnolo had me for twelve years, whereby I gained this manner of colouring; which Agnolo coloured with more charm and freshness than Taddeo his father.

First take a small vase; put into it (a tiny morsel is enough) a little bianco sangiovanni, and a little light cinabrese, about as much of one as of the other. Temper them very liquid with clean water; then with a soft bristle-brush, squeezed between the finger and thumb as before, go over the face when you have finished putting it in with verde-terra; and with this red colour (rossetta) touch in the lips and the roses of the cheeks. My master was accustomed to put

the colour in the cheeks nearer the ear than the nose, because it assisted in giving relief to the face, and then he softened the rosiness well into the surrounding colours. Then have three small vases, and make three shades of flesh-colour, so that the darkest may be darker by one-half than the rossetta, and the other two each lighter than the other in regular gradations. Now take the little vase containing the lightest tint, and with a very soft bristle-brush without a point take some of this flesh-colour, squeezing the brush with the fingers, and pick out the reliefs of the face; then take the vase containing the middle tint of the flesh-colour, and paint the middle tint of the face, hands, and body, when you paint a naked figure. Afterwards take the third vase of flesh-colour, and go to the edges of the shadows, but always taking care at the contours that the verde-terra should not lose its value, and in this manner keep on softening one flesh-tint into another, until it is all covered as well as the nature of the work will permit. But mind that if you would have your work appear very brilliant, be careful to keep each tint of colour in its place, except that with skill you soften one delicately into the other. But seeing others work and practising with your hand, will make you perceive better than seeing it merely written. When you have painted in these carnations, make from them a tint much

62 The Book of the Art

lighter—indeed almost white, and use this above the eyebrows, on the relief of the nose, the tip of the chin, and the upper eyelids; then take a sharp-pointed pencil of minever, and with pure white put in the whites of the eyes, and above the tip of the nose and a little on the fulness of the mouth (*della proda della bocca*), and so touch tenderly such lights. Then put a little black into another vase, and with a brush mark out the outlines of the eyes above the lights of the eyes, and make the nostrils of the nose, and the holes within the ear. Then put some dark sinopia into another vase, paint the under outline of the eyes, the contour of the nose, the brows and the mouth, and shade a little under the upper lip, which must be a little darker than the under. Before you finish these outlines thus, take the said brush and with verdaccio retouch the hair; then with the said brush, put on the lights of the hair with white, and with a watery wash of light ochre, and a soft bristle-brush, cover over the hair as you did the carnations. Mark out the extremities of the shadows with dark ochre, **then** with a small and very pointed pencil of minever **put on** the lights of the hair with bianco sangiovanni and light ochre. Retouch the outlines and extremities of the hair with sinopia as you did on the face, all over. And this is sufficient for you for a youthful face.

CHAP. 68.—*How to colour the face of an old person in fresco.*

When you wish to make the face of an old man, you must proceed in the same manner as in colouring the face of a young person, except that your verdaccio must be darker — also the carnations — observing exactly the same method as you did with the head of the young person, and also in the hands, feet, and body. But remember your old man must have his hair and beard grey. When you have put him in with verdaccio and white with your pointed pencil of minever, put into a small vase some bianco sangio-vanni and a little black mixed together, and liquid, and with a pencil of bristles without a point, and very soft, well squeezed, lay a ground-colour on the hair and beard; then make this mixture a little darker, and pick out the shades; afterwards take a very small and pointed pencil of minever, and make the light hairs of the head and beard. And with such colours you can make fur.

CHAP. 69.—*How to paint hair and beards of other sorts in fresco.*

When you would paint hair and beards of other hues, either red, or sandy, or black (*o sanguigue, o rossette, o negre*), or any other colour you please,

64 The Book of the Art

first make them in any case with verdaccio, and pick them out with white, and then lay on a flat colour in the usual mode, as above mentioned. Consider what colour you want, for the habit of seeing it will teach you how to do it.

CHAP. 70.—*Of the proportions of the human figure.*

Take note that, before I proceed further, I will make you acquainted with the proportions of a man; I omit those of a woman, because there is not one of them perfectly proportioned. First, as I have said before, the face is divided into three parts, namely, the forehead, one; the nose, another; and from the nose to the chin, the third; from the bridge of the nose through the whole length of the eye, one of these parts; from the corner of the eye right up to the ear, one of these parts; from one ear to the other, the length of one face; from the chin to the pit of the throat, one part; from the fork of the throat to the top of the shoulder, one face; and the other shoulder the same; from the shoulder to the elbow, one face; from the elbow to the (*al nodo della mano*) beginning of the hand, one face and one part; the whole length of the hand, one face; from the fork of the throat to the pit of the stomach, one face; from the pit of the stomach to the navel, one face; from the navel to the beginning of the thigh (*nodo della coscia*),

one face ; from the thigh to the knee, two faces ; from the knee to the heel, two faces ; from the heel to the sole of the foot, one part ; the length of the foot, one face. The length of a man is equal to his width with the arms extended. The arm with the hand reaches to the middle of the thigh. The whole length of a man is eight faces and two of these measures. A man has on his left side one rib less than a woman. And all over the body there are bones. The handsome man is dark, woman fair, &c.

I shall not speak of irrational animals, because they appear to have no certain proportions. Draw them as frequently as you can from nature and you will see. And this requires much practice.

CHAP. 71.—*How to colour drapery in fresco.*

Let us now return to colouring in fresco and on walls. If you wish to colour any drapery, you will design it first carefully (*gentilmente*) with your verdaccio, and do not let your drawing show too much, but moderately. Then, whether you choose to make a white, or red, or yellow, or green drapery, or any colour you please, take three small vases. Take one and put into it any colour you please—we will say red ; take some cinabrese, and a little bianco sangiovanni, and this shall be one gradation of colour ; let it be thoroughly mixed with water. Of the other two

66 The Book of the Art

colours make one of a very light tint—that is to say, put to it plenty of bianco sangiovanni. Now take some from the first vase and some of this light colour, and make a medium shade, and you will have three. Now take the first, that is, the dark shade, and with a large bristle-brush, a little pointed, go over the folds of the figure in the darkest places, but not exceeding half of the whole size of the figure. Then take the middle tint, lay on a flat colour from one dark fold to another, uniting them and softening them together, and softening the folds into the extremity of the shades; then with this middle tint go picking out the dark on the lighted side of the figure, preserving carefully the shape of the nude. Then take the third, lightest, colour, and in the same manner in which you picked out and laid the flat tint on the folds of the shadow side, so do the folds on the light side, arranging the folds with grace, propriety, and taste. When you have laid on each colour two or three times (never forsaking the plan of the colouring nor suffering one tint to take the place of, or give place to another, or mix with it except where they unite), soften and blend them together.¹ Then put in another vase, some colour much lighter than the lightest of the three, and pick out and give relief to the top of the folds. Into another vase put pure

¹ Se non quando si vengono a congiugnere sfuma li e commette li bene.

white, and put in finally the highest lights. Afterwards with pure cinabrese go over the darkest places and round some outlines, and this is the way drapery is usually done. But by seeing others work, you will understand better than by reading. When you have finished your figures, or historical pieces, leave them so that the lime and colours shall dry thoroughly all over; and if any drapery remain to be done when dry (in secco), you must proceed as follows.

CHAP. 72.—*The manner of colouring walls in secco, and the proper temperas.*

Any of the colours used in painting in fresco may also be used in secco; but in fresco some colours cannot be used, as orpiment, cinnabar, azzurro della magna, minio, biacca, verderame, and lacca.¹ Those which may be used in fresco are giallorino, bianco sangiovanni, black, ochre, cinabrese, sinopia, verde-terra, and amatisto.² Colours used in fresco must be made lighter with bianco sangiovanni, and if you wish the greens to preserve their green tint, make them lighter with giallorino;³ when you would have them take the colour of sage, add bianco. Those colours

¹ King's yellow, vermilion, blue verditer, red lead, white lead, verdigris, and lake.

² Naples yellow, lime-white, black, yellow ochre, red ochre with lime. red ochre, terre verte, soft hæmatite.

³ No Naples yellow (giallorino) known now is fit for fresco or any water-colour work. Cobalt blue and green oxide of chromium, and several whites, blacks, and ochres may be added to the list.

68 The Book of the Art

which cannot be used in fresco must be made lighter by the addition of biacca, giallorino, and sometimes orpiment, but orpiment is very rarely used; indeed I think it superfluous. To make a light blue, take three of the same kind of small vases as I directed you to use when speaking of the carnation tints and cinabrese, and prepare them in the same manner, except that where you then used bianco, you should now use biacca, and temper them all. Two sorts of tempera are good, but one is better than the other. The first tempera consists of the white and yolk of an egg, into which are put some cuttings of young shoots of a fig-tree; beat them well together; then add some of this tempera moderately, neither too much nor too little, to each of the vases, like mixing half wine with half water; then work with your colours, either white or green or red, as I directed you in fresco-painting; and you will proceed with your draperies in the same manner as you did in fresco, with a careful hand, waiting, however, till it (the plaster) is dry. If you use too much tempera, suddenly the colour will crack and peel off the wall. Be wise and skilful. Remember, before you begin to work, if you wish to make a drapery of lake, or of any other colour, take a clean sponge, and having mixed the white and yolk of an egg with about two porringers full of clean water, and mixed them well together, with the sponge squeezed half dry pass this

tempera over the whole of the space on which you have to paint in secco, and ornament in gold, and then colour freely as you please. The second kind of tempera is the yolk of the egg only; and you must know that this tempera is of universal application on walls, on panels, and on iron, and you cannot use too much of it, but be wise, and take a middle course. Before we proceed further, I would have you paint a drapery in secco in the same manner as you did in fresco, with cinabrese. Now I will have you make one of ultramarine blue. Take the three vases as usual; into the first put two parts azure and the third biacca; into the third, two parts biacca and one part azure: mix them and temper them as I have directed you. Then take the empty vase, that is to say, the second; put into it an equal quantity from each of the others, and stir all well together with a hog's-bristle brush, or, if you like, a minever brush blunt and firm; and with the first colour, that is to say the darkest, go round the outlines, marking out the darkest folds. Then take the middle colour and lay the flat tint of these dark folds, and mark out the light folds of the light side of the figure. Then take the third colour, and lay the flat tint of the light folds which come on the lighted side, and unite them with each other, softening and laying in the flat tints as I showed you how to do in fresco. Take the lightest colour, add to it some

70 The Book of the Art

biacca with tempera, and put on the high lights of the folds of the light part. Then take a little pure biacca, and retouch a few of the highest lights as the nude shape of the figure requires. Afterwards with pure ultramarine pick out the darkest folds and outlines, in this way retouching (*leccando*, lit. licking) the drapery according to its situation and colours, without soiling or mixing them one with another except to soften them. And in this manner use lake and all other colours with which you work in secco.

CHAP. 73.—*To know how to make a purple colour (bisso).*

If you would make a beautiful purple colour, take equal quantities of fine lake and ultramarine and temper them. Then take three little vases as above, and leave some of the purple colour to retouch the shades; and of the rest which you take out make three gradations of colour with which to colour the drapery, making each lighter than the other, as before directed.

CHAP. 74.—*To make a purple (bisso) colour in fresco.*

If you would make a purple colour to use in fresco-painting, take indigo and amatisto and mix them without tempera as before mentioned, and make four shades. Then paint your drapery.

CHAP. 75.—*To counterfeit ultramarine azure when painting in fresco.*

To make a drapery in fresco like ultramarine, mix indigo with bianco sangiovanni, and make them into regular gradations of colour; then glaze in secco the extreme darks with ultramarine.

CHAP. 76.—*To colour a drapery of a purple or morello colour (pagonazzo over' morello) in fresco.*

If you would paint a drapery in fresco like lake, take amatisto and bianco sangiovanni, and mix your colours in shades as before, softening and uniting them together. Then in secco retouch the extreme shades with pure lake, tempered.

CHAP. 77.—*To make a changing green drapery in fresco.*

If you would make a changing (rainbow-like, or shot) green drapery for an angel, lay a ground of two shades of carnation, one darker than the other, softening them well together. Then shade the dark part with ultramarine, and the lighter carnation tint shade with terra-verde, retouching them in secco. And remember that everything you

72 The Book of the Art

paint in fresco must be finished and retouched in secco with tempera. Put on the lights of the drapery in fresco, exactly as I directed you to do with other colours.

CHAP. 78.—*To make a changing colour called cignerognolo in fresco.*

Take bianco sangiovanni and black, and make a minever colour (*i.e.* colour of grey squirrel) called cignerognolo (ash-colour). Lay some as the flat ground-colour, put on what lights you please with giallorino, and some with bianco sangiovanni. Put the shades on as you like with purple, or black, or dark green.

CHAP. 79.—*To make a changing drapery of lake in secco.*

If you would make a changing drapery in secco, cover it with a flat tint of lake; use flesh-colour for the lights, or, if you will, giallorino. Glaze the dark parts as you like with pure lake, or purple (*bisso*), with tempera.

CHAP. 80.—*To make a changing drapery in fresco, or in secco, of ochre.*

To make a changing drapery of ochre either in fresco or in secco, cover with flat tints of ochre. Use bianco for the lights; for the lighter shades, shade with green; the darker, with black and sinopia, or, if you please, amatisto.

CHAP. 81.—*To make a changing drapery of a drab (berettino) colour, in fresco or in secco.*

If you would make a drab drapery, take black and ochre; that is, two parts ochre and the third black. Make your gradations of colour as I have before taught you in fresco and in secco.

CHAP. 82.—*To paint a drapery in fresco or in secco of a berettino colour, like that of wood.*

If you would make a drapery the colour of wood, take ochre, black, and sinopia; two parts ochre, and the other part black, and sinopia half the quantity of the ochre. With this make the gradations of your colours, in fresco or in secco, or in distemper.

CHAP. 83.—*To make a drapery of azzurro della magna or ultramarine, or a mantle for the Virgin.*

If you would make a mantle for our Lady of azzurro della magna, or any other drapery that you wish to be of azure alone, first lay in fresco a ground on the mantle or drapery of sinopia and black, two parts sinopia and the third black, having previously marked out the finished drawing of folds, with an iron point or needle; then "in secco" take azzurro della magna, well washed either with lye or with clean water, and grind it a very little on the stone. Then, if the blue is of a fine and full colour, add to it a little diluted glue, neither too strong nor too weak. Of this I shall hereafter speak. Again, put to the said azure a yolk of egg; but if the azzurro should be rather pale, it must be tempered with the yolk of country-laid eggs, which are very red-coloured; stir it well together with a soft hog's-hair brush, and pass it three or four times over the drapery.¹ When the ground is well covered and dry, with a little indigo and black shade the folds of the mantle as well as you can, returning many times over the shades with the point of the brush. If you would make it lighter on the knees or any other part, scrape to the pure blue with the handle of the brush. If you lay a ground on a drapery with ultramarine, temper it in the usual way

¹ It is not quite clear from the Italian whether the yolk is added to the size just mentioned or is used separately.

given for azzurro della magna, and lay on two or three coats of it. To shade the folds, take fine lake and a little black, tempered with the yolk of an egg. Shade them as tenderly as you can and very neatly, first with a little of this lake and afterwards with the point,¹ and make as few folds as you can, because ultramarine does not like the neighbourhood of other mixtures.

CHAP. 84.—*To make a black drapery, like that of a monk or friar, in fresco and in secco.*

If you would paint a black drapery of a monk or friar, take pure black, making your gradations of colour as I before directed you, in fresco and in secco, with tempera.

CHAP. 85.—*A good way of colouring a mountain in fresco or in secco.*

If you wish to make mountains in fresco or in secco, make verdaccio, one part of black, and two parts of ochre. Make your gradations in fresco with bianco, without tempera; and in secco use biacca with tempera; and give them form, as to a figure with darks and lights. And when you have to paint mountains which appear at a distance, make your colours darker; and if you would have them seem nearer, let your colours be lighter.

¹ The meaning is not very clear.

76 The Book of the Art

CHAP. 86.—*How to colour trees, plants, and grass, in fresco and in secco.*

If you would embellish these mountains with groves of trees and grass, first paint the trunk of the tree with pure black, which cannot be well done in fresco; then make some of the leaves of dark green or verde-azzurro (verde-terra is not good for this purpose) and let the foliage be well painted and dense; make a lighter green with giallorino, and let your leaves be smaller as you come towards the top of the tree. Touch the lights on the top with giallorino alone, and the trees and foliage will appear in relief; but first when you have painted the trees with black at the base, and also a few of the branches, let leaves shoot above, and then put the fruits, and scatter a few flowers and birds on the green grass.

CHAP. 87.—*How to colour buildings in fresco and in secco.*

If you would make buildings (*casamenti*), set them out in your design of any size you please, and stretch threads. Put them in first with verdaccio, or terra-verde, either in fresco or in secco, but let the colour be very liquid; some you may make purple, and some

cignerognolo (grey), some green, some drab (*berettino*, or wood-coloured), or any colour you please. Then make a long thin straight lath, one of the edges of which should be scooped out so as not to touch the wall, lest this should be spoiled by the passing over it and the rubbing of the brush and colours; and you will paint these cornices with great pleasure and delight. And in the same manner paint bases, columns, capitals, porticos, garlands of flowers, altar decorations, and the whole art of mazonneria,¹ which is a noble part of our art, and must be done with great delight. And remember that the same rules of light and shade which apply to figures, must be observed here with regard to these matters, and always apply this rule to buildings; that the cornice which you make at the top of the house on the shadow side must incline downwards; the middle cornice of the building facing you must be quite equal and even; and the cornice (plinth?) at the base of the building must ascend in a direction contrary to that at the top of the building, which descends.

¹ Mazonneria was anciently the art of making ornaments in relief, coloured and gilt, on panel pictures — French *maçonnerie*. See Milanese's glossary to Italian edition.

78 The Book of the Art

CHAP. 88.—*How to draw a mountain from nature well.*

If you wish to draw mountains well, so that they appear natural, procure some large stones, rocky and not polished, and draw from these, giving them lights and shades as the same rule guides you.

CHAP. 89.—*How to paint in oil on walls, panels, iron, or whatever you please.*

Before we proceed further, I will teach you to paint in oil on walls, or on panels, which is much practised by the Germans, and in the same way on iron or stone. But we will first speak of walls.

CHAP. 90.—*How to begin painting in oil on walls.*

Cover your wall with plaster, exactly as you would do when painting in fresco ; except that where you then covered but a small space at a time, you are now to spread it over your whole work. Make your design with charcoal, and fix it with ink or verdaccio, tempered. Then take a little glue, much diluted with water—a whole egg, well beaten in a porringer, with the milky juice of the fig-tree, is a still better tempera—you must add to the said egg a glassful of clean

water. Then, either with a sponge or a very soft brush without a point, go once over the whole ground on which you are going to paint, and leave it to dry for one day at least.

CHAP. 91.—*How to make oil fit for tempering colours, and also for mordants, by boiling over the fire.*

It will be very useful to you to know how to prepare this oil, for many things that are done; therefore, take one, two, three, or four pounds of linseed oil, and put it into a new pipkin; if it is glazed, so much the better. Make a small furnace, and make a round hole, into which the pipkin fits exactly, so that the flame may not reach it, because the fire easily catches it, and there would be danger to the oil, and also of burning the house. When you have made your furnace, put a moderate fire in it; and the more slowly your oil boils, the better and more perfect will it be. Let it boil until it is reduced to half the quantity. But to prepare mordants, when it is reduced to half the quantity, add to each pound of oil one ounce of liquid varnish (*vernice liquida*), and let it be very fine and clear: and oil thus prepared is good for mordants.

80 The Book of the Art

CHAP. 92.—*How to prepare good and perfect oil by cooking it in the sun.*

When you have prepared this oil (which is also cooked in another way, better for painting, but not for mordants, for which it must be done on the fire, that is, cooked), take your linseed oil, and in summer-time put it in a basin of bronze or copper. And in August (*quando è il sole leone*) place it in the sun; and if you keep it there till it is half wasted, it will be exactly right for mixing with colours. And you must know that, in Florence, I have found the finest and best that there can be.

CHAP. 93.—*How to grind colours in oil and to use them on walls.*

Let us return to grinding the colours. Begin and grind colour by colour, as you did when working in fresco, except that where you then ground them with water, you must now grind them with oil. And when you have ground them, that is to say all the colours, (for every colour can be mixed with oil except bianco sangiovanni), provide small vessels, either of lead or of tin, into which put these colours. And if you cannot find such, get glazed vessels, and put the ground colours into them; put them in a box, that they may keep clean. When you would paint a drapery

with three gradations of colour, as I have previously taught you, divide the space, and let each colour be laid in its proper place with a minever brush, uniting one colour well with another, the colours being very stiff. Then stop for a few days and return again to your work, see how the paint covers, and repaint where necessary. And in this way paint flesh or anything you please ; and in this way mountains, trees, and every other work. Provide a vessel of tin or lead (something like a lamp), about the height of your finger, half fill it with oil, and keep your brushes in it that they may not dry.

CHAP. 94.—*How to paint in oil on iron, on panels, and on stone.*

And in the same manner you may work on iron, on stone, or on any panel, always sizing first, and also on glass or on anything you please.

CHAP. 95.—*How to adorn walls with gold or with tin.*

Having now taught you how to paint in fresco, in secco, and in oil, I will tell you how to embellish walls with gilded tin, white tin, and fine gold, and take especial notice that you use as little silver as possible, because it does not last, and becomes black on walls

82 The Book of the Art

and on wood, but loses its colour quickest on walls. Use instead of it beaten tin, or tin plates. Beware also of alloyed gold (*oro di metà*) which quickly turns black.¹

CHAP. 96.—*Showing that you should always make a habit of working with fine gold and good colours.*

It is usual to adorn walls with gilded tin, because it is less expensive than gold. Nevertheless, I give you this advice, that you endeavour to adorn always with fine gold and good colours, particularly in the figures of our Lady. And if you say that a poor person cannot afford the expense, I answer that if you work well and give time to your work, and good colours, you will acquire so much fame, that a rich person will come to you to pay for the poor one; and your name will stand so high for using good colours, that if some masters receive one ducat for painting a figure, you will be offered two, and your wishes will be fulfilled; according to the old proverb,² good work, good pay. And whenever you should not be well paid, God and our Lady will reward your soul and body for it.

¹ Silver and alloyed gold such as white gold, which is a very beautiful alloy, can be protected with "fine silver varnish" (see p. 262, note 2).

² Chi grossamente lavora, grossamente guadagna.

CHAP. 97.—*In what manner you should cut gilded tin and ornament with it.*¹

When you ornament anything with tin, either white or gilded, and have to cut it with a knife, first procure a smooth plank of walnut, pear, or plum tree, not too thin, cut square each way like a sheet of paper (called) *reale*. Then take some liquid varnish, cover the board with it, and lay your piece of tin upon it, well spread and smooth. Then cut it with a knife very sharp at the point, and with a ruler cut off a strip the width you intend to make your fringes (*fregi*, borders?) either only tin, or wide enough to adorn them with black or other colours.

CHAP. 98.—*How to make green tin for ornaments.*

Again, in order to embellish these fringes (borders?) you may take *verderame* ground with linseed oil, and spread it over a sheet of white tin, and it will be a beautiful green. Let it dry in the sun, then spread it out upon a plank with varnish; then cut it with a knife; or if you would first stamp it with rosettes or other fair devices, anoint the plank with liquid varnish, and put your rosettes upon it, then fix them to the wall. Again, if you would make stars of fine gold, or a

¹ The use of tin covered with a yellow varnish was very common. The earliest directions for it are in the Lucca MS. But here the tin is gilt to imitate plates of solid metal.

84 The Book of the Art

diadem for saints, or ornaments with the knife, in the manner I have shown you, you must first put fine gold upon gilded tin.

CHAP. 99.—*How to make gilded tin, and how fine gold is laid on with gold size (doratura).*

Gilded tin is prepared in this manner. Have a very smooth plank, three or four braccia long, grease it with fat or with tallow. Put some white tin on it; then put a liquor called gold size (*doratura*) upon the tin in three or four places, a very little in each place; and with the palm of your hand pat the tin, spreading the gold size equally, as much in one place as in another. Let it dry in the sun. When it is almost dry, but still a very little sticky, take the fine gold, and put the pieces on in order, and cover the tin with this fine gold. Polish it with clean cotton; stick the tin to the plank, and when you would make use of it, apply with liquid varnish, and make stars or any ornaments you please, as you did with gilded tin.

CHAP. 100.—*How to make and cut stars and fix them on walls.*¹

You must first cut out all the stars with a ruler, and when you are going to put them on, first put over the

¹ Gilt stars in a blue vault are a Byzantine decoration in pictures and in buildings which lasted to quite a late period. Many examples may be seen in Siena.

azure, where the star is coming, a lump of wax, and work the star in rays, as you have cut them out in the plank. And you must know that in this way you can do much more work with less fine gold, than by putting it on with mordants.

CHAP. 101.—*In what manner this tin overlaid with gold can be used for the diadems (perhaps glories) of saints on walls.*

If you would make the diadems of saints without mordants, when you have coloured the figures in fresco take a needle and scrape (indent a line) around the contour of the head. Then, in secco, spread varnish upon the diadem, put on it the gilded tin that is overlaid with fine gold; then spread the varnish over it, pat it with the palm of your hand, and you will see all the marks made by the needle. With a well-sharpened knife-point, gently cut away the loose gold, and keep it for your other work.

CHAP. 102.—*How to raise a glory with lime on walls.*

You must know that a glory (again *diadema*) must be raised with a small trowel on the fresh mortar in this manner. When you have drawn the head of the figure, take the compasses and make the glory. Then

86 The Book of the Art

take a little very rich lime, worked like paste or ointment, and spread it over thickly in the further parts, but thinner near the head. Then take the compasses again, when you have smoothed the lime well, and with the knife cut away the lime above the line of the compasses, and it will remain raised. Then have a strong thin stick of wood, and indent the rays round the glory, and this is the way you are to do it on walls.

CHAP. 103.—*How, after painting on walls, we arrive at painting panels.*

When you do not choose to adorn your figures with tin, you must use mordants. Of these I shall treat fully hereafter, in their order; as to which can be used on panels, on glass, on iron, and every other thing; which are strong, and capable of withstanding air, wind and water; which require to be varnished, and which not.

But let us return to our colouring, and from walls proceed to panels, which are the neatest and pleasantest part of our art. And remember, that he who learns to paint first on walls, and then on panels, does not become so perfect a master of the art, as when he happens to learn to paint on panels first, and then on walls.

CHAP. 104.—*In what manner the art of painting pictures should be acquired.*

Know that you cannot learn to paint in less time than thus. In the first place, you must study drawing for at least one year,¹ on tablets; then you must remain with a master at the workshop, who understands working in all parts of the art; you must begin with grinding colours, and learn to boil down glues, to acquire the practice of laying grounds on panels, to work in relief upon them; and to rub them smooth and to gild; to engrave well; and this for six years; afterwards to practise colouring, to adorn with mordants, to make cloths of gold, and to be accustomed to paint on walls, for six more years,—always drawing without intermission either on holidays or workdays. And so, through long habit, good practice becomes a second nature. Adopting other habits, do not hope ever to attain great perfection. There are many who say they have learned the art without having been with a master. Do not believe them, for I give you this very book as

¹ The first year was a preliminary trial. If the master was satisfied at the end of that time, the boy was bound to him for twelve years. In the later years of the apprenticeship the lad's earnings helped to pay for his board and lodging. The pupil was sworn never to divulge the secrets of the art until he became a master himself, when he was allowed to teach his own pupils, first binding them to secrecy (*Ancient Practice of Painting*, I. cxviii.). See also Sienese Statute, *Carteggio inedito* (Gaye), Vol. II.

88 The Book of the Art

example: even studying it day and night, if you do not see some practice with some master, you will never be fit for anything, nor will you be able with a good face to stay among the masters.

CHAP. 105.—*How to make paste (colla di pasta over' angolo, i.e. glue of flour or chestnut flour?).*

Beginning to paint pictures (panels) in the name of the most Holy Trinity, and always invoking this name, and that of the glorious Virgin Mary, we must first prepare a foundation, and this is made with various kinds of glue. There is a cement made of boiled flour which is used by paper (or parchment) makers (*cartolari*) and the masters who make books, and is proper to fasten paper¹ (or parchment) together, and also to fix tin upon parchment. It is also used sometimes when paper is to be glued together for making transfer patterns.² This paste is made in the following manner. Fill a pipkin almost full of clean water, and make it very hot. When it is just going to boil, shake some fine flour, a little at a time, into the pipkin, stirring it continually with a small stick or spoon; make it boil, but do not make it too

¹ It is not possible to know certainly whether parchment or paper is meant when, as here, the word *carta* is used alone.

² Parchment for patterns (*patrons*) is frequently mentioned in English cathedral accounts.

thick. Pour it out and put it into a porringer. If you wish it not to go bad, add some salt, and use it when you want it.

CHAP. 106.—*How to make glue for fastening stones together.*

There is a cement proper for glueing stones, and this is made of mastic, new wax, and pounded stone, strained and well tempered together over the fire. First clean your stone, then heat it and apply the glue. It will withstand air and water, and is used to fasten grindstones and millstones.

CHAP. 107.—*How to make cement for joining glass vases.*

There is a cement proper for joining broken glasses or jugs, or other beautiful vases of Damascus or Majolica. This is made of liquid varnish, a little white lead, and a little verdigris. Put in it some of the same colour as the glass; if it is blue add a little indigo; if green, add more verdigris, *et sic de singulis*. Take the pieces of your broken vase or drinking-glasses, and though they be in a thousand pieces, join them together with this glue, putting it on thinly; and if you let them dry for the space of some months in the sun and wind, you will find

90 The Book of the Art

these vases stronger and better able to keep out the water where they are pieced than where they are whole.

CHAP. 108.—*How fish-glue is to be used and dissolved.*

There is a glue called fish-glue (*colla di pesce*, isin-glass). This is prepared from many kinds of fish. If you put a piece of this to your mouth as long as is necessary, and then rub a little on your sheepskin parchment, or other parchment, it will fasten them strongly together. When dissolved, it makes a good and most excellent cement for lutes, or other delicate works of parchment (or paper, *carta*), wood, and bone. When you put it over the fire, add for each piece of glue half a glass of clean water.

CHAP. 109.—*How colla di caravella is made, how tempered, and for what purposes used.*

There is a glue called *colla di spicchi*, which is made of the clippings of the muzzles of goats, feet, sinews, and many clippings of the skins. This glue is made in January or March during the great cold or high winds, and is boiled with an equal quantity of water until it is reduced one-half; then pour it into flat vessels, such as saucers for jelly, or basins.

Let it remain one night; the next morning cut it in slices, like bread, with a knife; put the pieces on rush-mats to dry in the wind, without sun, and it will become excellent glue. This glue is used by painters, by saddlers, and by many masters, as I shall hereafter tell you. It is good glue for wood, and many other things, of which we shall treat fully when showing how it is to be used, and in what manner for plaster, in tempering colours, making lutes, in inlaid works (*tarsie*), also to fasten wood, and the leaves (of books), in tempering plaster, in working with plaster in relief, and it is useful for many things.

CHAP. 110.—*A perfect glue (size) for tempering the gesso for panels (pictures).*

There is a glue made from waste of sheep and goat parchment, and from the clippings of this parchment. These are to be well washed, and put to soak for the space of one day before they are boiled down. Boil them till the quantity of water is reduced to one-third part; and I wish that, when you have no colla di spicchi, you should use this only for mixing with the gessos for your panels, and it is impossible anywhere to find better.

CHAP. III.—*Glue proper for tempering azures and other colours.*

There is a glue (size) made from the scrapings of goat and sheep parchment. Let it boil in clean water until the water is reduced to about a third in quantity. It makes a glue as clear as crystal, and is good for tempering dark blues; and if you should have laid a ground tint of any colour not properly tempered, give it a coat of this size and it tempers the colours again, and fixes them; you may varnish them if you please when used on pictures, and also blues on walls. This size is also good for mixing with grounds; but it is naturally thin, and (unsuitable for) plaster which is to be afterwards gilded, (for this) must have more body.

CHAP. II2.—*To make a glue of lime and cheese.*¹

There is a glue used by workers in wood which is made of cheese put into water to soften. Rub it down with a wooden pestle with both hands, adding a little quicklime. Apply it to the boards you wish to join, unite them, and fix them well together. And this is sufficient for you for making the different kinds of glue.

¹ Cheese and lime glue was much used for joining wood. It is quite insoluble in water. The cheese should be well washed. This glue is mentioned in the Lucca MS. and by Theophilus.

CHAP. 113.—*How to begin to paint pictures.*

Now we are really going to paint pictures. In the first place, a panel must be prepared of the wood of the poplar, which is very good (*ben gentile*), or lime-tree, or willow. Begin with the flat surface of the picture; if it is defaced with knots, or if it is greasy, you must cut it away as far as the grease extends, for there is no other remedy. Take care that the wood is very dry; and if it is such a piece that you can boil in a cauldron of clean water, the wood will never do you the ill turn of splitting. Let us now return to the knots or any other defects in the flat surface of the panel. Take some size (*colla di spicchi*) and about a glassful of clean water, melt and boil two pieces (*spicchi*) in a pipkin free from grease; then put in a porringer some sawdust, and knead it into the glue; fill up the defects or knots with the wooden spatula, and let it dry. Then scrape smooth with a knife-point to level the surface. Examine if there is any nail, or other thing, that renders the panel uneven, and knock it well into the wood; then take glue and pieces of tin, beaten like quattrini (small pieces of money), and cover over the iron with them. And this is done that the rust of the iron may never rise through the ground. The flat surface of the panel must never be too much smoothed. Boil some glue made of

shavings of sheep parchment till the water is reduced to one-third of what it was at first. Feel with the palms of the hands, and when you feel one hand stick to the other, it is sufficiently boiled. Strain it two or three times. Put half this glue into a pipkin, add a third part of water, and make it very hot. Then with a hog's-hair brush, large and soft, pass a coat of the glue over the panel and carved foliage or pyxes (*civori*)¹ or columns, or whatever you work upon, that is to be covered with gesso, and let it dry. Then take some of your first strong glue (size), and pass it twice over your work, letting it dry well between each coat of glue (size), and it will be properly sized. Do you know the effect of the first glue? It is merely a weaker liquor, and just as if when fasting, you eat a few comfits and drank a glass of good wine, which gives you an appetite for dinner. Such is this size; it adapts the wood for taking the size and grounds.

CHAP. 114.—*How to fasten linen on panels.*

Having thus applied the size, get some linen cloth, old, fine, and white, and free from all grease. Take your best size, cut or tear large or small strips of this linen, soak these in the size, and spread them

¹ Milanesi considers that *civori* means the pinnacle-work of the upper part of the framing of altar-pieces.

with your hands over the surface of the panel; remove the seams, and spread the strips out with the palms of the hands, and leave them to dry for two days. And remember it is best to use size when the weather is dry and windy. Size is stronger in the winter than in summer, and in winter gilding must be done in damp and rainy weather.

CHAP. 115.—*How to lay grounds of gesso grosso on the flat surface of a picture with a spatula (stecca, float?).*

When the panel is quite dry, take the point of a knife like a file (*mella*, rasp?) which rasps well, and search over the surface to find any little knots, or any seams, and remove them. Then take some gesso grosso, that is to say volteranno (plaster of Paris) purified (*purgato*) and sifted like flour. Put a porringer-full on the porphyry slab, grind it well with this size by hand as you would grind colours, collect it with a spatula, and put it on the surface of the panel, and with a very smooth and rather large spatula (*stecca*) cover the whole surface, and whenever you can use the spatula, do so. Then take some of this ground plaster (*gesso*), warm it, take a soft hog's-hair brush and give it a coat on the cornices and foliage, as on the even surface with the spatula. Give three or four coats on the

96 The Book of the Art

other parts of the cornices; but on the level parts you cannot put on too much. Leave it to dry for two or three days. Then take the iron rasp (*mesella*) and scrape the flat surface; procure some small iron tools, which are called *raffiette*, such as you will find at the painters'; there are several kinds of them. Pick out all the cornices and foliage if not well done, that they may not be choked up, and generally take care that all defects of the flat surface or cornices are remedied by this grounding of plaster.

CHAP. 116.—*How to prepare gesso sottile (slaked plaster of Paris) for grounding panels.*

You must now prepare a plaster for fine grounds, called *gesso sottile*. This is made from the same plaster as the last, but it must be well purified (*purgata*), and kept moist in a large tub for at least a month; renew the water every day until it almost rots, and is completely slaked, and all fiery heat goes out of it, and it becomes as soft as silk. Throw away the water, make it into cakes, and let it dry; and this *gesso* is sold by the druggists to our painters.¹ It is used for grounding, for gilding, for working in relief, and other fine works.

¹ To make sure that the plaster cannot set, about a gallon of water must be put to each pound of plaster. When ready, the water can be strained off through a tammy or linen sieve.

CHAP. 117.—*How a panel is ground with gesso sottile, and how it is to be tempered.*

Having laid on the gesso grosso, rubbed it smooth, and levelled it well and delicately, take some of this gesso sottile, and put it cake by cake into a pipkin of clean water, and let it absorb as much as it will. Put it little by little on the porphyry slab, and without adding any more water to it, grind it perfectly. Put it then on a piece of linen cloth, strong and white, and go on till you have as much as a loaf, then fold it up in this cloth, and wring it well to get as much water out as possible. When you have ground as much of it as you want, for you must consider what quantity you will want, that you may neither have to make two portions or tempered plaster, nor to throw away any good plaster, take some of the same size with which you tempered the gesso grosso. You must make sufficient at one time to temper both kinds of gesso. The gesso sottile requires less tempering than the gesso grosso; the reason? that the gesso grosso is the foundation of all your work, and you must also reflect, that howsoever much you press the gesso sottile a little water will still remain in it. For this reason, diligently make the same size for both. Take a new pipkin which is free from grease, and

98 The Book of the Art

if it is glazed, so much the better. Take a cake of this gesso sottile and scrape it fine with a knife, as you would cheese, and put it into the pipkin. Put some of the size on it and work the gesso with the hand, as you would a paste for making fritters, smoothly and dexterously, so that it may not froth at all. Have a cauldron of water, and make it very hot, and put into it the pipkin containing the tempered gesso. This will keep the gesso warm, and it will not boil; for if it should boil it would be spoiled. When it is warm, take your panel, and with a large and very soft brush of hog's bristles, dip in the pipkin and take some in moderate quantity, neither too much nor too little, and spread it evenly over the level surfaces, the cornices, and the carved foliage. It is true that in doing this the first time you should spread and rub the gesso with your fingers and hand, round and round, and this will incorporate the gesso grosso with the gesso sottile. When you have done this, begin again, and lay on one coat with the brush without rubbing it in with the hand. Let it rest a little, but not so as to dry thoroughly; then go over again in the other direction also with the brush, and let it dry as usual, then give another coat in the reverse direction; and in this manner, always keeping your gesso warm, give the flat surfaces eight coats at least. Foliage and other reliefs do

with less, but you cannot put too much on the flat. This is on account of the rasping or rubbing down, which is done next.

CHAP. 118.—*How to prepare grounds of gesso sottile, not having previously laid on a ground with gesso grosso.*

Small and delicate works may, as I told you before, be sized two or three times, and then give them as many coats of gesso sottile only as you find from experience they will require.

CHAP. 119.—*How to temper and grind gesso sottile for working in relief.*

There are, nevertheless, some persons who grind gesso sottile with water and size. This is proper for grounds where no gesso grosso is used, which required to be more tempered. This same kind of gesso is good for raising foliage and other works in relief, which frequently has to be done. But when you are going to execute works in relief with this gesso, add to it enough Armenian bole to give it a little colour.

CHAP. 120.—*How to begin to smooth the surface of a panel grounded with gesso sottile.*

When you have finished laying the ground, which must be done in one day, even if you work at it in the night, to allow the necessary intervals of time, let it dry without sun for two days and nights at least. The longer you let it dry the better. Tie some powdered charcoal like a ball in a piece of linen, and powder it over the ground of the picture. Then with a bunch of feathers of a hen or goose, spread this black powder equally over the ground. And this is because the surface cannot be scraped too perfectly, and because the iron tool with which you scrape the surface is flat also. Where you remove the surface the ground will be as white as milk. Then you will see whether it requires more scraping.

CHAP. 121.—*How to scrape gesso sottile on the flat surface, and of what use the scraping is.*

Take a flat raffietto, about as wide as a finger, and gently go all round the surface of the cornice once; then with a sharp rasp (or rough file), with as straight an edge as possible, scrape over the flat surface of the panel with a very light hand, not grasping the rasp at all tight, and brushing away the loose

gesso with the bunch of feathers. And know that this dust is excellent for removing grease from the pages of books. In the same manner rub smooth the cornices and foliage, and polish them as if they were ivory. And sometimes, through haste and much work, you may polish cornices and foliage, by rubbing them with a piece of linen, first wetted and then squeezed almost dry.

CHAP. 122.—*How you should first draw on the panels with charcoal, and fix your outlines with ink.*

Having well scraped the ground, and made it like ivory, the first thing you should do is to draw on your panel with those sticks of willow charcoal which I previously taught you to make. But you must fasten the charcoal to a stick about the length of your face, which is a help in composing. Have a feather ready, that when any stroke appears to you to be badly drawn, you may efface it with the feather, and draw it again. Draw with a light hand, and shade the folds and the faces as you did with the brush or with the pen in making a pen-and-ink drawing. When you have finished drawing your figures, especially if the picture be of great value, and you expect gain and honour from it, leave it for a day, return many times to examine it, and improve it where there is need.

102 The Book of the Art

When it appears to you correctly drawn, and you can copy from or look at things done by other good masters, which is no shame to you if the figure is good, gently rub away the charcoal with the feather from the design, so that it may be just seen, but not too much, lest you should not understand your design. Put a few drops of ink into a glass half full of water, and with a pointed minever brush mark over the outline of your design. Then with the feather part of the pen, brush away the charcoal. With some more of the ink, and a flat-pointed minever brush, shade any fold and any shaded part of the face, and you will have made an agreeable design, which will cause all men to fall in love with your works.

CHAP. 123.—*How you should indicate the outlines of the figures when you are going to make a gold ground.*

When you have sketched your design on the panel, have a needle fixed into a small stick and engrave the outlines of the figure which come against the background which you are going to cover with gold, also the borders which you intend to make on the figures, and certain draperies, which are to be of cloth of gold.

CHAP. 124.—*How works in relief are executed on panels with gesso sottile, and how precious stones are affixed to them.*

Besides this, take some of the same gesso for reliefs, if you would raise ornaments or foliage, or fix precious stones to certain ornaments (*fregi*, borders?) belonging to the figure of God the Father, or to Our Lady, or certain other ornaments which embellish your work, and which are stones of various coloured glass. Arrange them with judgment, having your gesso in a vessel upon some hot ashes, and another vessel of hot water, because you must wash your brush frequently; and this brush must be of minever, the hairs fine and rather long. Take a little of the gesso on the point of the brush, and with that quickly raise whatever figures you wish to make in relief; and if you raise any foliage, draw the design previously like the figures, and be careful not to relieve too many things, or confusedly, for the clearer you make your foliage ornaments, the better will you be able to display the ingraining with stamps, and they can be better burnished with the stone. There are some masters who, having relieved all they wish, give one or two coats of the gesso which they have used for the ground of the picture, that is, of gesso sottile, with a soft, small bristle-brush. But if you relieve

104 The Book of the Art

but little, it appears to me that it will be better, firmer, and safer work without this further application, for the reason I have before given you, not to use different kinds of tempered gesso on the same picture.

CHAP. 125.—*How to make casts in rilievo work, to adorn some parts of the picture.*

As we are talking about relief work, I will tell you a few things. With the same kind of gesso, or made with more size, you may cast a head of a lion or other shapes modelled in earth or in chalk. Oil the mould with lamp-oil (*olio da bruciare*), fill it with the gesso well tempered, and let it cool thoroughly; then remove the gesso with the point of a knife and blow upon it hard. It will come out quite clean; let it dry. Then in any ornamenting use the same gesso which you grounded and relieved with, first oiling the part with the brush where the head is to be fixed, then press it with the finger and it will stick properly. Afterwards with a minever brush lay a coat or two of the same gesso on the parts in relief, pressing with the finger on the cast figure and it will please you. Afterwards feel over with the knife-point, and if there are any little lumps, remove them.

CHAP. 126.—*How to plaster (smaltare) on relievos on walls.*

I shall also teach you how to raise designs in relief on walls. In the first place, there are certain parts of the wall that are either embossed or carved with foliage, on which the plaster cannot be spread with a trowel. Take some lime and sand, both well sifted, put them in a basin, and with a large bristle-brush, make them into a paste with water, and apply several coats of this plaster with the same brush on these places. Then smooth the parts with the trowel, and the plastering is done. You may paint on it in fresco or in secco, as I directed you when speaking of fresco-painting.

CHAP. 127.—*How to make reliefs in lime on walls like the reliefs of gesso on panels.*

Again, with the before-mentioned lime, ground a little on the stone; you can make what you please in relief on the walls, as I have told you to do with regard to panels, that is, on the fresh lime and intonaco.

106 The Book of the Art

CHAP. 128.—*How reliefs may be taken from a stone mould, and how they may be used on walls.*

You may also have a stone cut with any devices you please, and grease the design with lard or tallow. Get some beaten tin, and lay moist tow over the tin and lay that over the engraved stone, and beat as hard as you can with a mallet of willow. Then have some gesso grosso, ground up with size, and with the spatula fill up the moulds with it; you may use them to adorn walls, coffers, stone, and anything you please; then apply the mordant over the tin, and when it is a little tacky, cover it with fine gold. When dry attach it to the wall with ship-pitch.

CHAP. 129.—*How to execute reliefs on walls with varnish.*

You may also relieve on walls in this manner: Mix liquid varnish with flour, and grind them well together, and execute your reliefs with a pointed minever brush.

CHAP. 130.—*How to execute reliefs on walls with wax.*

In the same manner you may also make reliefs on walls with melted wax and with ship-pitch melted together, two parts wax and the third pitch. Make the reliefs with a brush, and let it be warm.

CHAP. 131.—*How to lay bole on panels, and how to temper it.*

Let us return to our subject. When you have finished the reliefs of your picture, get some Armenian bole, and take it of good quality. Touch your underlip with it; if it sticks to it, it is good. You must now learn the best tempera for gilding. Put the white of an egg into a very clean glazed basin.¹ Take a broom of twigs cut equal, and as if you beat spinach, that is, beating it very fine, so beat up the white of egg with it till the basin is full of thick froth, which appears like snow. Then take a common drinking-glass, not too large, and not quite full of water; pour it on the white of egg into the basin. Let it stand from night till the next morning, to clarify itself. Then grind the bole with this tempera as perfectly as you can. Take a nice sponge, wash it well and dip it into clean water, and squeeze it; rub lightly with the sponge, not too wet, on those parts on which the gold is to be laid. Then with a large minever brush distemper this ground bole as liquid as water for the first coat, and where you have wetted with the sponge spread this bole thinly, and beware of leaving edges

¹ White of egg is usually whipped on a plate with a knife, or in a basin with a wire whisk. If any yolk is mixed with it, it will not froth properly.

108 The Book of the Art

with the brush. Then wait a little; put a little more bole into your vessel, and let the second coat of colour have a little more body. Give it this second coat, and let it again rest a short time; put more bole into the vase, and give it a third coat in the same manner, making no hard edges. Put more bole still into the vase, and give it a fourth coat, and then you will have finished laying on the bole. Now you may cover over your panel with a cloth, to keep it as much as you can from dust, sun, and water.

CHAP. 132.—*Another mode of tempering bole on panels, and of gilding.*

This tempera may be tempered in a different way. In order to grind the bole, put the whole albumen of an egg on the porphyry slab, then take the pulverised bole and grind it into this albumen. Grind it very fine, and if it dries under your hands, add to it while on the stone a little very clean water. When it is well ground, dilute it until it flows from the brush like clear water, and give your work three or four coats, in the manner above directed. This is a surer way than any other tempera if you have not much experience. Cover your picture, and keep it well from dust, as I have told you before.

CHAP. 133.—*How to gild with verde-terra on panels.*

You may also adopt the same process as that used by the ancients, namely, to stretch linen over the panel before you lay on the gesso, and then put on the gold with verde-terra, grinding the verde-terra as you like, in either of the two sorts of temperas, as I have taught you above.

CHAP. 134.—*How gold is laid on panels.*

When mild, damp weather comes, and you wish to lay on gold, place your panel flat on two trestles. Sweep it well with the feathers; and take a *raffietto* and feel with a light hand over the ground of bole, and if there is any dirt or knot or roughness, remove it. Take a piece of linen rag (or ravelling), and burnish the bole with great care. If you afterwards burnish it with a tooth, it cannot but be of assistance. When you have thus cleaned and burnished it, take a glass nearly full of clear water, very clean, and put into it a little of the white-of-egg tempera; if it is not at all stale, so much the better. Mix it thoroughly in the glass with the water. Take a large minever brush, made of the hairs of the tip of the tail, as I told you before. Take your fine gold, and with a pair of small pincers take

110 The Book of the Art

up a leaf of the gold. Have a card (or piece of parchment?) cut square, with the corners cut off. Hold it in your left hand, and with the brush, which you hold in your right hand, wet the bole sufficiently to hold the piece of gold you have in your hand. Wet the bole equally, that there may not be more water on one part than on another; then let the gold gently approach to the wet bole, and take care that the gold projects a trifle beyond the card, so that the edge of the card may not get wet. Now, as soon as the gold has touched the wet part, withdraw the card quickly and suddenly; and if you perceive that the gold does not adhere everywhere, take a piece of clean cotton and press the said gold down as gently as you possibly can; and in this manner put on the other pieces; and when you are wetting for the second piece, be careful that the brush does not go so near the first piece as to go over it, and let the piece you are putting on overlap a trifle the one already laid, first breathing on it, that the gold may adhere where it overlaps. When you have laid on three pieces, press the first piece again with the cotton, first breathing on the gold, and that will show if any part requires mending. Prepare a cushion as large as a brick, made of a smooth piece of board covered with soft leather, white and not greasy, of the same kind as that of which boots are made. Nail it over,

stretched, and fill between the wood and the leather with a few shreds of cloth; then on this cushion spread out a piece of gold, and with a flat-edged knife cut the gold into pieces as you want it. For the defects which there may be, have a little pointed minever brush, and with the same tempera wet the defective places, and wetting with the lips the handle of the brush, it will be able to take up the little bits of gold and lay them on the defective place. When you have laid as much gold on the level surface as you can burnish in one day, for which I shall give you directions when you have to gild cornices and foliage, be careful to collect the small pieces of gold, as that master does who wishes to pave the road, being always as sparing of the gold as you can be, and always covering with a clean handkerchief the gold which you have laid on.

CHAP. 135.—*What stones are proper for burnishing gold.*

When you mean to burnish gold, you must have a stone called lapis amatisto,¹ which I will teach you to prepare. If you have not this stone, sapphires, emeralds, balass-rubies, topazes, rubies, and garnets are still better for those who can afford the expense,

¹ The stone intended here is not amethyst, but the hard hæmatite.

112 The Book of the Art

and the nobler the stone, the better it is for this purpose. The teeth of dogs, lions, wolves, cats, leopards, and of all clean flesh-feeding animals are also good.

CHAP. 136.—*How to prepare stones for burnishing.*

Get a piece of lapis amatisto; take care to choose one that is sound and without flaw, with the veining running lengthwise. Grind it on the grindstone, and make it very smooth and polished, and about the width of two fingers, or how you can. Then take emerald dust, and rub it till it has no sharp edge, but only a sort of backbone, and round off all the corners and put it in a handle of wood, with a band of brass or copper, and let the handle be round and smooth, so that the palm of the hand may rest well upon it. Then polish it in the following manner: Put some charcoal powder upon a porphyry slab, and grasping the stone well in the hand, as if you were burnishing with it, burnish it on the slab, and your stone will become hard, dark, and shining as a diamond. You must be very careful that it does not hit anything or touch iron, and when you would use it to burnish gold or silver, put it first into your bosom to get rid of any dampness, for gold must be humoured (*chè l'oro e motto schifo*).

CHAP. 137.—*How to burnish gold, and what to do if you cannot burnish it when ready for burnishing.*

You must now burnish gold, for the time is come that you should do so. It is true that in winter you may put on gold whenever you please, during damp and mild weather, but not during very dry weather. In summer, lay on gold one hour and burnish it the next; but should the gilding remain too damp, and from some cause or other you want to burnish it, keep it in a place where it will not feel any ardour of heat or air; but if it is too dry, keep it in a damp place, always covered; and when you would burnish it, uncover it gently and carefully, for the smallest scratch will blemish it. If you put it in a cellar at the foot of the casks, it will become fit to burnish. But should you be prevented from burnishing anything for eight or ten days or a month, take a very clean handkerchief or a towel, lay it over your gold in the cellar, or wherever it may be; then take another handkerchief, dip it in clean water, wring and squeeze it very dry; open it, and spread it over the first handkerchief that you laid over the gold, and the gold will then become fit for burnishing. Now I have told you the sort of condition in which gold is fit to be burnished.

CHAP. 138.—*Now I will explain to you how to burnish gold, and in what direction, especially when laid on flat surfaces.*

Take your panel, or anything on which you have laid gold. Place it level upon trestles or on a bench. Take your burnisher, rub it on your breast, or on any part of your clothes that is not greasy. Warm it well; then try whether the gold is fit for burnishing. Feel it carefully, always with doubt. If you feel any powder under the stone or scratching as you would feel powder between your teeth, take a minever's tail and sweep with a light hand over the gold, moving the stone very softly, and if ever, as you burnish, you see that the gold is not as even in its brilliance as a looking-glass, put over a piece or half a piece (a leaf or half a leaf), first breathing on it, and immediately burnish with the stone. And if it should happen that the surface of the gold is obstinate and does not come as you wish, you may remedy it in the manner I have just described; and if you can afford the expense, you will add materially to the perfection of your work, and to your own honour, if you gild in this manner the whole of your ground. When it is properly burnished, the gold will appear almost dark from its own brightness.

CHAP. 139.—*What gold and of what thickness is proper to be used for burnishing and mordants.*

You should know that the gold proper to be laid on flat surfaces is that where 100 leaves only are made from the ducat, and not 145 pieces, because the gold for gilding flat surfaces must be more dead-looking (*piu appannato*). And if you would know good gold when you buy it, get it from a person who is a good gold-beater; and look at the gold: if it appears cloudy and dull like parchment, then consider it good. For cornices and foliage thinner gold is better; and for the delicate fringes and ornaments laid on with mordants, the gold should be very thin and gossamer-like (cobwebby).

CHAP. 140.—*How to begin to turn glories (volgere le diademe), to engrave the gold, and indent the outlines of the figures.*

When you have burnished and finished your panel, you must first take the compasses and describe the circles for the glories or crowns (*corone o ver diademe*).¹ Engrave them, add fringes, indent them with small stamping tools so that they glitter like grains of millet; adorn with other stamping tools, and engrave

¹ Perhaps only synonymous terms for the nimbus. Such duplication of nomenclature is very frequent in the *Trattato*.

116 The Book of the Art

if there is foliage. To see some practice is necessary for this. When you have thus formed the glories and ornaments, put into a glazed vessel a little biacca, well ground with some thin size, and with a small minever brush, ground and outline the figures where they come against the background, as you find them marked out by the lines which you scratched with the needle, before you put on the bole. Again, if you would dispense with the biacca and brush, scrape away the gold which encroaches on the figures, and this will be the best plan.

This stamping on gold with small patterns (*granare*) which I have told you about is one of the most beautiful parts of our art: it can be done all over, and it can be done in relief, as I have said; and guided by a just fancy and with a light hand, you may make foliage designs and little angels, and other figures which will shine through the gold; but in the folds and in the shadows you do not stamp any patterns; in the half-lights a few, and a good many in the lights; because this stamping, so to say, brightens the gold, which otherwise is dark where it is burnished. But before you stamp (or engrave?) any leaf-work or figure draw upon the gold ground whatever you want to do, with either a silver or lead style.¹

¹ This last paragraph is only in the Riccardiana MS.

CHAP. 141.—*How to represent a cloth of gold, or black or green, or of any colour you please, on a ground of gold.*

Before you begin to colour, I should like to show you how to make a cloth of gold. If you would have a mantle, or a woman's petticoat, or a little cushion of cloth of gold, put on the gold-leaf with bole, and scratch the folds of the drapery in the manner I have shown you formerly for putting on a background. Then, if you wish to make a red drapery, lay a flat tint of cinnabar upon the burnished gold. For darkening it, use lake; for lightening it minium, all tempered with the yolk of an egg, not rubbing the surface too hard with your brush, nor touching it too many times. Let it dry, and go over it at least twice. In the same manner you may make green or black draperies, if you please. But if you would make a beautiful drapery of ultramarine blue, first lay a flat tint on the gold of biacca tempered with the yolk of an egg. When it is dry, temper your ultramarine with a little size, and a little yolk of egg, perhaps two drops. Pass it over the white two or three times, and let it dry. Then, according to the drapery you wish to paint, prepare your powders; that is, you must draw the designs first on parchment and prick them in fine holes with a needle, holding a piece of cloth under the parchment, or, if

118 The Book of the Art

you like, a board of lime-tree wood or alder wood; this is better than cloth. When the holes are pricked, take powder according to the colour of the drapery you have to transfer to. If it is white, dust with charcoal powder tied in a rag; if it is black, dust with biacca, also tied in a rag—and *sic de singulis*. Make your transfer patterns match well at the edges.

CHAP. 142.—*How to draw, engrave (grattare),¹ and indent (granare) on cloth of gold or silver.*

Having transferred the design to the drapery by dusting powder (through the holes of the cartoon) take a stiletto (small style) of birch, or other hard wood, or of bone, pointed like a proper drawing style at one end, at the other blunt for engraving. And with the point of this style pick out the drawing of all the draperies, and with the other end scrape off the paint to the gold below, without rubbing off the gold, whatever you wish either in the background or the pattern work, and you can stamp patterns with the rosetta² on what you uncover. And if in certain small parts of the design you cannot use the rosetta,

¹ *Grattare* here means to scrape lines and patterns through paint to the underlying gold—easy with tempera paint—a method frequently employed in *quattro cento* pictures; it is more beautiful and brilliant than gilding with mordants.

² No doubt the rosetta was a tool making a print of tiny indented clustered dots.

you must use an iron point like a drawing-style. And this is how you begin to learn to make gold draperies. If you would make silver draperies, you must proceed in exactly the same manner in putting on the silver as in putting on the gold. I advise you too, if you want to teach boys or children to put on gold, let them begin with silver, that they may get some practice, for it is cheaper.

CHAP. 143.—*How to make a rich drapery of gold or silver or ultramarine blue, and how it is made of gilded tin on walls.*¹

Again, if you wish to make a rich drapery of gold, there is the way of ornamenting this garment with leaf-work in relief, or with stones of many colours set in it; then lay fine gold all over, then stamp patterns on when it is burnished.

Ad idem. Cover the whole ground with gold; burnish it; design upon it the drapery which you wish to make, hunting scenes or other subjects. Then stamp the patterns (*granare*) on the ground or ornamental work (*lacci*), that is, what you have already designed.

Ad idem. Put on the gold ground, draw whatever design you wish, lay over, when the design requires it,

¹ The careful study of gold draperies and backgrounds in mediæval pictures will best explain this chapter.

120 The Book of the Art

a ground colour of verdigris in oil ; shading each fold twice ; then putting one coat evenly everywhere over the ground and designs.

Ad idem. Put on the ground with gold, burnish it, and stamp (*granare*) it in relief.¹

Ad idem. Lay silver over the drapery ; draw the pattern of the stuff when it is burnished, which latter is always implied ; lay in the ground or coloured spaces in the design with cinnabar, tempered with yolk of egg ; then with a fine lake and oil give one or two coats over all the work, either the ground or coloured parts of the pattern.

Ad idem. If you wish to make a beautiful drapery of ultramarine blue, cover the garment with burnished silver ; design the pattern of the stuff, and put on this azure, whether covering the ground or in patterns, tempered with size. Then spread some of it equally all over the grounds and the coloured patterns, and it will be a velvet-like drapery.

Ad idem. Ground the draperies, the figure, with what colour you like ; shade it. Then take a fine minever brush, and the mordants. When you have dusted on the pattern of the stuff and borders (*lacci*), work with mordants, which I have told you about already. And you can use these mordants for gold or silver, and you will get beautiful draperies if you rub and burnish them with cotton-wool.

¹ This stamping in relief is not very intelligible.

Ad idem. Having laid in a ground of whatever colour you like as I have just told you, if you make a shot effect, work on the gold with whatever colour you like, but different from the ground colour.

Ad idem on the wall. Make the garment of gilded tin; put in what ground-colour you like; dust the design on and engrave the pattern of the drapery by scraping with the wooden style, the colours being always tempered with yolk of egg. And it will be a very good drapery for a wall. But you can work with mordants on a wall, the same as on a panel.

CHAP. 144.—*How to imitate velvet or linen on walls, and also silks on walls or panels.*

If you would imitate velvet, paint the drapery of any colour you please, tempering your colour with the yolk of an egg. Make the pile on the velvet with a minever brush with colour tempered with oil. Make the pile with thick paint. And in this manner you may imitate red, black, or any other coloured velvet, tempering your colours as before. Sometimes it is a good thing to show on a wall, a lining or a garment or drapery which should really appear woollen. And to do this, when you have laid on the plaster, smoothed and coloured it, reserve that part which you are now going to do thus: take a small bit of board, a little bigger than a play-tablet, and sprinkling water on this

or on the place in the picture, move this little board round and round ; the lime will become rough and ill-polished. Colour it as it is without being smoothed, and it will appear like real woollen cloth.

Ad idem. If you would make a silk drapery either on panels or on walls, lay on the ground with cinnabar and lighten with minium, or if you like with sinopia, and lighten with giallorino on walls ; and in panels with orpiment or green or any colour you please. Lay the ground dark, and lighten it with a light colour.

Ad idem. On walls in fresco. Lay on a ground of indigo, and lighten with indigo and bianco sangiovanni mixed together, and if you would use these colours on panels or on shields, mix indigo with biacca, tempered with size ; and in this manner you may make many kinds of drapery, according to your abilities and inclination.

CHAP. 145.—*How to paint on a panel, and how to temper the colours.*

I think that you will have so much understanding from your own experience as will enable you to teach yourself from these rules to paint skilfully many kinds of drapery, and by the grace of God we must come to painting on a panel. You must know that painting on panels is the proper employment of a

gentleman ; and that, with velvet on his back, he may do what he pleases. It is true that pictures are painted just as I explained to you to work in fresco, with three exceptions. One is that you must always paint the draperies and buildings before the faces. The second is that you must temper your colours always with yolk of egg and thoroughly tempered, always as much of the yolk as of the colours which you temper with it. The third is this, that the colours must be ground very fine, well ground, just like water. And that you may have great pleasure, begin to paint draperies in lake in the same manner that I taught you in fresco-painting ; namely, let the first gradation be pure colour, then take two parts lake and the third biacca—and of this when tempered make three gradations, but little varying from each other ; temper them well, and make them lighter with biacca finely ground. Then take your panel before you, and always keep it covered with a cloth for love of the gold and the ground, that they may not be hurt by the dust ; and that your work may be fair and clean when it leaves your hands. Then take a minever brush without a point, and begin to lay on the dark colour, and make out the shadows in what should be the dark part of the figure. Then in the usual manner take the middle tint and paint the reflected lights, and lights¹ of the dark folds, and begin with the same

¹ I dossi e relievi delle pieghe scure.

124 The Book of the Art

colour to make out the folds of the lighted side. Then with the lightest colour paint the light reliefs on the light side of the figure, and in this manner return to the first dark folds of the drapery with the dark colour. And thus, as you have begun, go many times over with these colours, first one and then the other, painting them over and uniting them skilfully, and softening them tenderly. And now it is time to leave your work and to rest yourself for a short space, and then return to the work on your panel. You should always take pleasure in your work. When you have covered the ground properly with these three gradations of colour, take the lightest, and prepare another still lighter, always washing the former colours from the brush. Make another colour still lighter than this, and let them vary but little from each other. Then touch with pure white, tempered as above on the high lights; and thus paint the shades one after the other in regular gradations, until they reach the deepest shades of pure lake. And remember that, as you have made your colours in gradations, so you must arrange your vases in order of this gradation, that you may not mistake one for the other. Thus in this manner you may paint any colour you please, either red, or white, or yellow, or green. But if you would make a beautiful purple (*bisso*) colour take fine lake, and the best ultramarine blue, finely ground, and of this mixture,

with biacca, properly tempered, make your gradations of colour. If you would make a light blue colour, lighten it with biacca, and paint it in the manner above described.

CHAP. 146.—*How to paint draperies of blue, gold, or purple (porpora).*

If you would make a blue drapery, neither all mixed with white, nor all pure blue, take several shades of ultramarine, of which there are many, one lighter than the other. Colour them according to the lights and shades of the figure, in the manner I have shown you. And you may use them on walls, with the same tempera as above, in secco. And if you will not afford the expense of using these shades of ultramarine, you may find similar shades of azzurro della magna; or if you wish to make a gold pattern on the blue, you may do so. You can touch with a little purple (*bisso*) in the dark of the folds and a little on the lights, making out the folds delicately on the gold. These draperies will please you much, particularly in the draperies of the Lord God. If you would clothe Our Lady in a purple drapery, paint the drapery white, and shade it with a very light bisso, but little removed from white; make the patterns of fine gold, making out the folds in the gold with a little dark purple. This will be very lovely.

126 The Book of the Art

CHAP. 147.—*How to colour faces, hands, feet, and flesh generally.*

Having drawn and coloured draperies, trees, buildings, and mountains, you should next colour flesh, which you should begin in the following manner. Take a little verde-terra, and a little well-tempered biacca, and go twice over the face, hands, feet, and all the naked parts. But this first bed of colour must, when painting the faces of young persons with fresh complexions, be tempered with the yolk of the egg of a city hen; because they have lighter yolks than those laid by country hens, which, from their redness, are only fit to temper the flesh-colouring of old and dark persons. Now bear in mind, that when painting on walls you made your rosy tints (*rossette*) with cinabrese; on a panel they must be of cinnabar, and the first rosy tints must not consist of pure cinnabar, but you must add a little white (*biacca*) to it, and also to the verdaccio with which you first shade. Then, as you did in painting on walls, you must prepare three gradations of flesh-colour, one lighter than the other, laying every tint in its right place in the face, taking care not to cover over the whole of the verdaccio, but shading partially on it with the darkest flesh-colour, making it very liquid, and softening off the colour in the tenderest manner. On a panel more coats of colour are required than on a

wall, yet not so many but that the green tint under the flesh-colour should be just visible through it. When you have worked your flesh colours, and the face begins to look nearly right, make a flesh-tint lighter still, and paint the prominent parts of the face, putting on the lights gradually in the most delicate manner, until at last you touch in the highest lights, as over the eyebrows, and on the tip of the nose, with a little pure white. Paint the outlines of the upper eyelids with black, also the eyelashes and the nostrils. Then take a little dark sinopia with a little black, and make the outline of the nose, eyes, eyebrows, hair, hands and feet, and generally of every part, as I directed you when painting on walls always with the same tempera of yolk of egg.

CHAP. 148.—*How to colour a dead man, his hair and beard.*

Next we shall speak of colouring a dead man,—that is to say, his face, his body, or any naked part that may be visible either on a panel or a wall; except that on a wall you need not first lay a ground tint of verde-terra. If it is laid on the half-tints, between the lights and shades, that will be sufficient. But on a panel you must lay it on in the usual way as directed for colouring living faces, and also shade it in the same way with verdaccio. You must use no

128 The Book of the Art

rosy tints, because dead persons have no colour ; but take a little light ochre for your three gradations of flesh-colour, mixed with white, and temper in the usual manner, laying each tint in its place, and softening them into each other, as well on the face as on the body. And in the same manner, when you have nearly covered your ground, make the lightest flesh-tint still lighter, reducing it to pure white for the highest lights. Then mark the outlines with dark sinopia, mixed with a little black, which is called 'sanguigno,' and in the same manner the hair, but not so that it shall appear to be alive but dead, with several shades of verdaccio, and as I showed you how to paint several kinds of beards on walls, in the same way paint on panels, and so paint the bones of Christians or rational creatures with this same flesh-colour.

CHAP. 149.—*How to paint a wounded person or the wound.*

Having to paint a wounded person, you must lay a tint of pure cinnabar wherever the blood is to appear. Then take fine lake tempered in the usual manner, and shade the wound and the drops of blood.

CHAP. 150.—*How to colour water, or a river, with or without fish, on walls or on pictures.*

When you would paint water, a river or any other water, either with or without fish, on walls, or on panels—for walls take the same verdaccio with which you shaded faces on the lime intonaco—draw the fish, and shade them with the verdaccio; but only the shades on the back, for I must inform you that fish and irrational animals generally have their dark parts upwards, and their light parts beneath. When you have finished shading with the verdaccio, whiten them beneath, with bianco sangiovanni on walls, on panels with biacca, and then pass some touches of the same verdaccio over the fish and the water. If you would make a variety in your fish, let some have a row of spines of gold on their backs. In secco lay a tint of verdigris ground in oil, over the water, and the same on panels; or if you do not choose to use oil, take verde-terra, or verde-azzurro, and cover every part equally, but not so much but that you may see the fish and the waves of the water. And if needful lighten the waves with bianco on walls, and tempered biacca on panels. This is sufficient information for you on colouring. We shall now proceed to the art of embellishing,¹ but we must first speak of mordants.

¹ That is, with gilding.

130 The Book of the Art

CHAP. 151.—*The way to make a good mordant for laying gold on draperies and ornaments.*

A mordant is made which is perfect for walls, on panels, on glass, on iron, and in every place: it is made in this way. You will take your oil, which has been cooked on the fire or in the sun, cooked in the way I told you before, and grind with this oil a little biacca (lead-white) and verdigris; and when you have ground it like water, put a little varnish (or resin)¹ in it, and let everything boil together for a little while. Then take one of your glazed vessels and put it in and let it rest. And when you want to use it either for cloths (*panni*, draperies?) or for adornments, take a little in a small vessel, and a minever brush, made in the quill of a pigeon's or hen's feather, and make it stiff and pointed, with the point coming out very little beyond the quill. Then dip the tip of the point into the mordant, and make your ornaments and borders (*fregi*), and, as I tell you, never load the brush too much. The reason is that in this way your work will come like fine hairs, which is very lovely work. Do you wish to hear more about doing it? wait till the next day; then feel what you have done with the ring-finger of the right hand, that is, with the tip of the finger, and if it is only slightly tacky, then

¹ When a prepared varnish is intended, we find *vernice liquida*. *Vernice* alone here probably means dry sandarach resin.

take the pincers, cut off half a leaf of fine gold, or alloyed gold (*oro di metà*), or of silver, though these two do not last, and lay it upon the mordant. Press it with cotton, and with the same finger stroke the piece of gold, putting some over the mordant where there is none. Don't do it with any other finger-tip, for this is the most sensitive and delicate of the whole hand, and take care that your hands are always clean. I warn you that gold which is laid over mordants, especially in such very fine work, must be the thinnest beaten gold which you can get; for if it is thick you cannot use it so well. When you have put on all the gold, if you wish you can let it remain till another day; and then take a feather, and sweep all over, and if you like collect the sweepings of the gold and keep them. They do for goldsmiths or for your own work. Then take clean new cotton, and burnish perfectly your gilt borders.

CHAP. 152.—*How to temper this mordant to put the gold on more quickly.*

If you wish this mordant, first described, to last eight days before the gilding is done, do not put any verdigris in it. If you wish that it should last four days, put a little verdigris; if that it should be good from one evening to another, put plenty of verdigris, and also a very little bole. And if you find that any

132 The Book of the Art

person blames you for using verdigris, for fear it should contaminate the gold, tell them I have proved it, and that the gold keeps quite well.

CHAP. 153.—*The way to make another mordant with garlic, and where it is best to use it.*¹

There is another mordant which is made in this way. Take clean garlicks, one, two, or three pans full; pound them in a mortar; squeeze them in a piece of linen, two or three times. Take this juice and grind it as firmly as possible with a little biacca and bole. Then collect it, put in a vase, cover it and keep it, and the older it is, the better it is. Do not take small or young garlic, but half-grown ones. And when you wish to use this mordant, put a little in a glazed vessel, with a little wine, and stir it thoroughly together with a skewer till it flows from your brush in such manner as to be fit to work skilfully with. Then, after half-an-hour, the gold can be laid on as has been described already. The nature of this mordant is such that it will remain fit for putting the gold on for half-an-hour, an hour, or a day, or a week, or a month, or a year, whenever you like. But keep it covered and preserve it well from dust. This mordant is not proof against water and damp, but can be used in churches, and elsewhere under cover

¹ This mordant is not very usual, but is given in the *Hermeneia*.

if the wall is built of bricks; but it is most suited for panels and ironwork, and on anything which is varnished with liquid varnish. And these two ways for the two different species of mordants are enough for you.

CHAP. 154.—*Of varnishing.*

I think I have said enough on the subject of painting on walls in fresco, in secco, and on panels. But we shall say more further on about the manner of painting and gilding and making miniatures on parchment. But first I want you to see how to varnish pictures on panels and all other works except on walls.

CHAP. 155.—*How and when to varnish pictures.*

You must know that the best varnishing is to delay as long as possible after your picture is painted—the longer the better. And I speak truth when I say, that if you delay for several years, or at least for one year, your work will be much fresher. The reason of this is, that the colouring naturally acquires the same condition as the gold, which shuns a mixture with other metals; so that the colours, when mixed with their proper tempera, dislike the inmixture of other tempera. Varnish is a strong liquor and gives great force (*dimostrativo*), and will be obeyed in everything, and annuls every other tempera. And suddenly as you spread it over the picture, the colours lose their

134 The Book of the Art

natural strength and must obey the varnish, and their own tempera has no longer power to refresh them. It is therefore proper to delay varnishing as long as you can ; for if you varnish after the tempera has had the proper effect on the colours, they will afterwards become more fresh and beautiful, and will remain always the same. Then take liquid varnish, the brightest and clearest you can obtain ; place your picture in the sun, wipe it and clean it as thoroughly as you can from dust and dirt of every kind, and take care that it is weather without wind, because the dust is subtle ; and every time that the wind blows it over your picture, you will have more difficulty in making it clean. You might well varnish in such a place as a green meadow or by the sea, that the dust may do no harm. When you have warmed the picture in the sun, and the varnish also, place the picture level, and with your hands spread the varnish all over thinly and well. But be careful not to go over the gold with it, for association with varnish and other liquors are displeasing to it. If you do not choose to spread the varnish with your hand, dip a small piece of fine sponge into the varnish, rolling it with the hand over the picture varnish in the usual manner, adding or taking away as is needful. If you wish the varnish to dry without sun, boil it well first, and the picture will be much better for not being too much exposed to the sun.

CHAP. 156.—*How in a short time you can make a picture look as if it had been varnished.*¹

If you would have your picture appear in a short time to have been varnished when it has not been, take the white of an egg, beaten thoroughly with a whisk as much as it can be, until it makes a thick froth. Let it stand one night to clear itself. Put the clear part into a clean vessel, and spread it with a minever brush over your works, which will appear as if varnished, and they are even stronger. This varnish is applicable to detached figures in relief either of wood or stone. In this way you may varnish the faces, hands, and flesh of such figures generally. And this is enough to say about varnishing. We will now speak of painting miniatures on parchment.

CHAP. 157.—*How you must do miniature-painting and put gold on parchment.*

First, if you would paint miniatures you must draw with a leaden style figures, foliage, letters, or whatever you please, on parchment, that is to say in books: then with a pen you must make the delicate permanent outline of what you have designed. Then you must

¹ White of egg is sometimes used as a temporary varnish on oil-painting, but must be removed before the permanent varnish or it cracks. It could not be removed from tempera.

136 The Book of the Art

have a paint that is a sort of gesso, called asiso, and it is made in this manner ; namely, a little gesso sottile and a little biacca, never more of this than equals a third part of the gesso ; then take a little candy, less than the biacca ; grind these ingredients very finely with clear water, collect them together, and let them dry, without sun. When you wish to use some to put on gold, cut off a piece as large as you have need of, and temper it with the white of an egg, well beaten, as I have taught you. Temper this mixture with it ; let it dry ; then take your gold, and either breathing on it or not, as you please, you can put it on ; and the gold being laid on, take the tooth or burnishing-stone and burnish it, but hold under the parchment a firm tablet of good wood, very smooth. And you must know that you may write letters with a pen and this asiso, or lay a ground of it, or whatever you please—it is most excellent. But before you lay the gold on it, see whether it is needful to scrape or level it with the point of a knife, or clean it in any way, for your brush sometimes puts more on in one place than in another. Always beware of this.

CHAP. 158.—*Another way of laying gold on parchment.*

If you would like another kind of asiso—but this is not so good, but may be used for putting on gold

grounds, though not to write with—take gesso sottile, and a third part biacca, a fourth part Armenian bole, with a little sugar; grind all these very finely with the white of an egg; lay on the ground in the usual manner, and let it dry; then with the point of a knife scrape and clean the gesso. Put the previously mentioned tablet under the parchment, or a very flat stone, and burnish it; and should it by chance not burnish well when you put on the gold, wet the gesso with clean water with a small minever brush, and when it is dry burnish it.

CHAP. 159.—*Of a colour like gold which is called porporina, and how it is made.*

I will show you how to make a colour like gold which is a good colour for miniature-painters on parchment, and also on panels if it should be employed; but beware, as of poison or fire, lest this colour, which is called porporina, should approach a gold ground; for I warn you, if a ground of gold were made which reached from hence to Rome, and if a piece of quicksilver as large as half a grain of millet were to touch the gold ground, it would be sufficient to spoil the whole. The best remedy you can have is quickly with the point of a knife or needle to make a scratch on the gold, and it will not get any further hold on it. This porporina colour is made as follows:

138 The Book of the Art

Take sal armeniaca, tin, sulphur, and quicksilver, of each equal parts, except that there must be less quicksilver. Put these things in a vessel of iron, copper, or glass, melt it all on the fire, and it is done; then temper with the white of an egg and gum-arabic, and use it as you please. If you make draperies with it, shade it with lake or azure or purple, always tempering the colours on parchment (*carta*) with gum-arabic.

CHAP. 160.—*How to grind gold and silver, and how to temper them to make foliage and embellishments, and how verde-terra can be varnished.*

If you would work with gold on pictures, panels, parchment, or walls, or on anything you please (but not covering all over as in grounds of gold), or if you wish to paint some tree that might appear as of the trees of paradise, take pieces of fine gold in quantity according to the work you are going to paint or write, that is to say about ten or twenty pieces, put them on the porphyry slab, and grind them with the well-beaten white of an egg; then put the whole into a glazed vessel. Put sufficient tempera to make it flow from the pen or brush, and you may do any work you please with it. You may also grind it with gum-arabic for use on parchment, and if you make leaves of trees, mix with the gold a little green very finely

ground for the dark leaves; and in this manner, mingling in other colours, you may make changing colours at your discretion. With this kind of gold, silver, or alloyed gold (*oro di metà*) you may make 'reticulated¹ gold-work' (?) (*cardare*) on draperies in the antique manner, and certain ornaments which are not used by many other painters; yet if you paint them well, they will increase your reputation. But what I teach you, you must use great judgment to know how to carry it all out well.

CHAP. 161.—*Of the colours which are used in working on parchment.*

It is true that all colours which you use on panels you can use on parchment; but they must be ground very finely. It is also true that there are certain colours which have no body, which are called 'pezzuole,'² which are made in all sorts of colours; and it is only necessary to take a bit of rag of any tint, and to put it in a glazed vessel, or drinking-glass, and to put some gum with it, and it is fit to work with. A colour is made besides of Brazil wood boiled with lye and rock-alum, and then when it is cold it is ground with caustic lime, and it makes a very fair red and gets in this way a little body.

¹ Probably the curious gold lines used in early Siennese and early Russian work in the place of folds on the draperies of the Madonna and the Saviour.

² Bits of linen soaked in transparent colours.

140 The Book of the Art

CHAP. 162.—*Of the way to work on linen or hempen cloth.*¹

Now let us speak of the way to work on cloth, that is, either linen or canvas, and you will observe this method in painting on any kind of cloth; that in the first place it is necessary to stretch it firmly on the frame (stretcher), nailing the seams straight first, then going round and round with little nails, spreading it equally and in an exact manner, getting all the

¹ The later chapters of the *Trattato* beginning here, which are not contained in the Ottobonian MS. first printed by Tambroni, treat of the more decorative parts of the painter's art, and one or two of these are almost childish as that on mosaic, so that, there being also a slight difference in style, I have sometimes thought that these chapters were not written by Cennino. Such decorative work, however, certainly formed part of the painter's business, and is often alluded to by Vasari. Some extracts from the Latin statute of the Guild of Painters of Venice, dated 1272, in J. P. Richter's "National Gallery," give particulars of what was expected from them. Their works are classed as (1) *Scuta* and *rodellæ*, namely shields, oval and round, decorated with paintings; (2) *Cophani* and *arcellæ*, or painted chests; (3) Utensils for the table, *i.e.* plates and dishes of wood and painted table-tops. It is only at the end of the list that *ancone* are mentioned; the word always used by Cennino as synonymous with *tavola*. Both meant small sacred pictures on wood of the Madonna or saints. It does not seem, however, that each person did all the kinds of work. Up to the last days of the Republic the following craftsmen were included in the ranks of the Guild. At its head were the *dipintori*, the painters; then the *miniatori*, or miniaturists; the *disegnatori*, designers, who only furnished drawings for embroidery; the *maschereri*, the mask painters, who also produced plaster figures; *lavoratori di cuoi d'oro* who furnished the gilded leather hangings; finally the *cartolari*, who made and sold playing cards. It was only in the year 1636 that the painters of pictures withdrew from the Guild.

threads precisely in the right direction. When you have done this, take gesso sottile (slaked plaster of Paris) and a little starch, or a little sugar, and grind these with size in the same manner that you tempered gesso for panels, grinding it very fine; but first with this size, without gesso, go once over the whole; and if the size were not so strong as that which is mixed with the gesso, never mind. Let it be as hot as possible, and with a blunt, soft bristle-brush, put some all over every part where you have to paint. Then take the cloth when it is dry; have a knife-blade (*mella di coltello*) level at the edge and straight as a cord, and with it put this gesso on the cloth, putting it on and scraping it off equally, and the less gesso you leave on the better; only just let it fill up the holes between the threads. It is enough to put the gesso on once. When it is dry, take a knife that scrapes well, and look over the cloth to see whether there are any knots or lumps, and remove them; and then take your charcoal, and in the same way that you drew on the panel, draw now on cloth, and fix the drawing with water-colour made of ink. Next I wish to teach you, that if you wish to make glories and backgrounds of burnished gold, this is put on both linen and canvas with mordants, and because the following way is marvellously better than others which many people have used, I am going to tell you about it; and the cloth can be rolled up and folded, without hurting the

142 The Book of the Art

gold and the colours. First take the said gesso sottile with a little bole, and temper this gesso with a little white of egg and size, and put one coat over the place where you are going to lay on gold. When it is dry, scrape it a little; then take bole, ground and tempered as it should be for putting on a panel, and put on five or six coats of it, and leave it for a few days. Put on your gold exactly as you would on a panel, and burnish it, holding under the cloth a smooth firm board, having a cushion between the cloth and the board, and in this way engrave and stamp the glories (or diadems), and they will be exactly the same as on a panel. But it is advisable then, as sometimes these banners which are made for churches are carried outside when it rains, indeed necessary, to see to having a very clear varnish, and when you varnish the painting, varnish a little the diadems and the gold background.

You must colour on cloth in the method used for panels, that is, in stages (*di passo in passo*), and it is pleasanter than working on panels; because the cloth retains the moisture (*il molle*) a little;¹ and it is exactly like working in fresco, that is, on walls. Also I warn you that when you are colouring, the colours must be

¹ May this be a reference to the method suggested by Vasari and Armenini of sponging the back of a tempera picture on canvas and so being able to keep the painting moist for a time? It should be clearly understood that even so the paint could not be dragged and worked like fresh oil-paint. (Vasari, *Introd.*, c. 25; Armenini, *De veri Precetti della Pittura*, Ravenna, 1587, L. ii. c. 8.)

put on in many, many coats, even more than on panels, because cloth has no substance like panels, and the varnishing will not show up bright, if the paint is thin. Temper the colours similarly as for a panel. I will not speak at greater length on this subject.

CHAP. 163.—*How to work on black or blue cloth or on a curtain.*

If you were to have to work on black or blue cloth such as a curtain, stretch your cloth in the manner described above. It is not necessary to put on gesso; you cannot draw with charcoal. Take tailor's chalk, and carefully make such little pieces of it as you would make sticks of charcoal; and put them into the opening of a goose-quill, of whatever size is required. Put a stick to the quill and draw lightly. Then fix it with tempered biacca. Then put on a coat of that size which you temper gesso with on panels: then lay the ground-colour as much as you can, and paint the draperies, faces, mountains, buildings, and what seems good to you, and temper in the accustomed way. Also in painting curtains, you may take white cloth, and apply it upon the blue cloth, stuck on with paste in the manner of glue; and put it on according to the figures which you wish to disperse over the space, and you can paint it with certain water-colours without varnishing afterwards. And a

144 The Book of the Art

good many are done in this way and cheaply, and are very good for the price. Also on curtains you can make foliage enrichments with the brush, of indigo and biacca on the plain ground, tempered with size; and leave among this foliage work, some good spaces, to put in gilt adornments, made with oil mordants.

CHAP. 164.—*How to design on cloth or canvas for the use of embroiderers.*

Also you must sometimes provide embroiderers with various sorts of designs. And for this work make these masters prepare cloth or canvas well stretched on a frame; and if it is white cloth (linen, probably), take your accustomed charcoals and draw what you like. Then take pen and ink and draw it correctly, as you did with a brush on panels. Then brush away the charcoal, then take a well-washed sponge with the water squeezed out. Rub the linen on the opposite side from the drawing, and use the sponge just so much that the linen (cloth) is wetted as much as the drawing will bear. Then take a small soft minever brush, dip it in the ink, squeeze it well, and with this begin to shade in the darkest places, lightening and softening little by little. You will find that however coarse the cloth may be, in this way the shadows will be so softened that it will seem a marvel to you. And if the cloth should dry before you have

shaded enough, wet it over again with the sponge as usual, and this is sufficient for working on cloth.

CHAP. 165.—*Of working on canvas for baldachinos, banners, standards, and other works, and of putting on diadems or fields of gold.*

If you have to work on canvas baldachinos or other works, stretch them first on a frame, as I told you in the case of linen cloth; and, according to the colour of the ground, take either charcoal or white chalks. Make your design, and draw it exactly with ink or tempered colour, and if on each side there is to be the same story or figure, put the frame up to the sun, turning the side which is drawn upon towards the sun, so that it may shine through. Stand behind with your tempered colour; and with a very fine minever brush, go over the shadows of your design which you will see showing through. If you have to draw at night, put a big lamp on the side you have drawn upon, and a little one on the side on which you have to draw. That is, when you are working there might be a double lamp on the side which is drawn upon, and a candle on the side you are drawing. If there is no sun, and you have to draw by daylight, let the light of the two windows be on the side which is drawn upon, and on that where you are drawing let the light fall from one

146 The Book of the Art

very small window. Then size with the usual size, wherever you have to paint and put on gold, and mix a little white of egg with the said size, as it might be one white of egg in four glasses of size; and when you have sized, if you want to put on any diadem or field of burnished gold, to bring you honour and fair name, take gesso sottile (slaked plaster of Paris) and a little Armenian bole, ground together very finely with a morsel of sugar. Then with the usual size, and a very very little white of egg mixed with a little biacca, go thinly twice over, where you want to put on the gold. Then put on your bole as if you were putting it on a panel; then put on your gold with clear water, mixing in this a little of the tempera of the bole, and burnish it on a very smooth stone, or a firm smooth board; and so engrave and stamp it over this board. Then you can paint everything in the usual way, the colours being tempered with yolk of egg, and being laid on in seven or eight or ten coats in consideration of the varnishing; and then you can put on the diadems (or glories) and gold backgrounds, with oil mordants, and the ornaments with garlic mordants, varnished afterwards; but oil mordants are better. And this is enough for standards and banners and all the rest.

CHAP. 166.—*The way to paint and put on gold on velvets.*

If you have to work on velvets and design for embroiderers, draw your work with a pen, either with ink or with tempered biacca. If you have to colour anything or put on gold, take the usual size, and an equal quantity of white of egg, and a little biacca, and with a bristle brush put some over the pile, beat it hard down and press (bruise) it flat, then colour and put on gold in the way described; but it must be gold applied with mordants. But it will be less trouble to do the work on white canvas, having cut out in it the figures or other designs, and have them sewn into the velvet by the embroiderers.

CHAP. 167.—*Of working on woollen cloth.*

If by chance you should have to work on woollen cloth, by reason of tourneys or jousts (for there are some gentlemen, and great and important seigniors, who wish for strange things, and they will have their devices in gold and silver on this kind of cloth), first take, according to the colour of the cloth, whatever chalk you require for designing, and fix the outline with the pen, as you did upon velvet; and then take the white of egg well beaten, as I taught you first, and put some on the nap of the cloth in that part where

148 The Book of the Art

you have to lay on the gold. Then when it is dry, burnish with a tooth over the said cloth ; then lay on two or three coats of the same tempera. When it is dry put on your mordant, taking care that it does not go beyond the prepared place ; and put on such gold and silver as appears pleasing and right to you.

CHAP. 168. — *How to paint trappings for horses, devices and mantles (giornee) for tournaments and jousts.*

Sometimes in these tournaments and jousts there are made on the trappings of the horses and on mantles (*giornee*) certain raised devices sewn upon them. So I will explain to you how they are made of paper (*carta bambagina*) ; first these sheets of paper are covered all over the whole sheet with burnished gold or silver ; and it is done in this manner, which is thus : grind a little ochre or tailor's chalk, as finely as you can, a very very little Armenian bole ; temper them together with size, which must be almost water, that is, not at all strong, but with very little substance or goodness ; and with a soft bristle-brush, or, if you like, a minever brush, put one coat, over the sheets of this paper which should be fit for writing on but not written, and when they are dry begin again, and bit by bit wet with a minever brush and put on the gold, just with the

same method and rule, as on a panel with bole; and then, when you have overlaid the whole sheet, watch for the right time for burnishing. Have a very level stone, or a very smooth board, and on that burnish your sheets, and put them aside. And with these sheets you can make animals, flowers, roses, and many sorts of devices, and it will do you great honour; and you do it quickly and well; and you can adorn them with any rich colouring in oil.

CHAP. 169.—*To make crests (cimieri) or helmets for tournaments and rectors (? heralds, rettori).*

In case you have to make any crest or helmet for tournaments, or for 'rettori' who have to go before the signoria, you must first have white leather, which must not be otherwise prepared than with 'mortina,' or, if you like, 'cefalonia';¹ stretch it, and draw your crests as you wish it done; and draw two, and sew them together, one with the other, but leave so much space on one of the sides, that you can put sand in, and with a small stick press it till it is equally full. When you have done thus, put it in the sun for a good many days; when it is thoroughly dry, take out the sand; then take the size which is used with gesso and size it two or three times. Then take gesso

¹ *Mortina*, myrtle; includes bilberries, used for dyeing yellow. *Cefalonia* perhaps stands for Valonia or gall-nuts of *Querens Cerris*. (See German "Cennino," p. 177.)

150 The Book of the Art

grosso (unslaked) ground with size, and mix with it some picked tow, and have it stiff like dough; and begin putting on this gesso, sketching with it the form of man, animal, or bird, which you have to do, making as good a resemblance as possible. This being done, take some gesso grosso ground with liquid size, and flowing from the brush, and with a brush lay three or four coats over this crest. Then when it is quite dry, scrape it and smooth it as if you were working on a panel. Then, in the same way that I explained to you to ground on a panel with gesso sottile, put this gesso on the crest. When it is dry scrape it and smooth it, and when it is needful to make glass eyes put them on with gesso used for relief work, and make relief work if required. Then, if it has to be gilt or silvered, put on bole, as on a panel, and similarly as to everything else, including colouring; varnishing it in the accustomed manner.

CHAP. 170.—*How to work on coffers or chests, and the manner of ornamenting and painting them.*

Supposing you wish to work on coffers or chests, and to do them really well, ground them with gesso, and observe the whole method of working on a panel, as to putting on gold, painting, engraving, ornamenting, and varnishing, so I need not go over each point at length.

If you wish to decorate other coffers of less value, size them first, and glue cloth on the cracks, which you do also to the others above described; but you ground these first with the float (*stecca*) and (? or) with the brush, with well-sifted wood-ashes, and the usual size. When it is grounded and dry, smooth it and, if you like, ground (or prime) it with gesso sottile.

If you wish to ornament with certain figures of tin or with other devices, observe this method, which is: have a fine stone, flat and hard (*macigna*), and on this stone cut out any pattern you like, or get it cut for you—a very slight hollow is enough. Here cut out figures, animals, devices, flowers, stars, roses, of any fashion that you fancy. Then have beaten tin, whichever you like, whether yellow, or whether white, in several folds, and lay it over the impression that you want to print. Then have a lump of wet tow, squeeze it and lay it over this tin; and have in the other hand a mallet, not too heavy, of willow-wood, and beat on this tow, collecting it and turning it with the other hand; and when you have beaten it enough and it shows perfectly every incision beneath, take gesso grosso, ground with rather stiff size, and with a spatula (*stecca*) put some over this beaten tin. When you have done this take a small knife, and with the point catch hold of one bit of the tin, separate it and lift it up, then again with your *stecca*

152 The Book of the Art

and your gesso in the same way find and separate another piece of tin. Make so many in this way that you will have amply enough, and put them to dry. When they are dry have a very sharp-pointed knife, and putting these tin pieces one at a time on a very flat walnut board, cut away all the tin which projects beyond the outline of your figure, and in this way make what quantity you want of them.

When you have primed and laid the ground colour of your chests, according to rule, with whatever colour you like, take some of the usual glue, but stronger, and thoroughly wet the gesso of your figures and devices, and immediately stick on and arrange (these figures) in the space to be painted on the chest, and with a minever brush outline and put in some flat colouring (*coloruzzo*—? tinting), then varnish the whole ground. When it is dry take a beaten white of egg, and with a sponge dipped in this white (*glair*) rub all over the varnish, and then with other colours do line work and ornamentation¹ on the said ground with whatever colour you like, so in part varying the ground colour ; and I will not speak of this at greater length, because if you are expert and practised in great things, you will know how to do well in small things ; and next I will tell you how to work upon glass.

¹ *Va palliando e adornando.* *Falliare*, according to Milanese, means drawing with fine lines. An enrichment in strong body colour, like a lace or brocade design, showing the ground colour between the lines, seems to be the kind of thing intended,

CHAP. 171.—*How windows are painted on glass.*

Painting on glass is done in two ways, that is, upon windows, and upon pieces of glass which are used on small pictures, or in the adornment of reliquaries. It is best we should speak first about the method for windows. It is true that this art is little practised by our craft, but more by those who work specially at it; and commonly those masters who work at it have more practical knowledge than design, and on account of their half knowledge, and for guidance in drawing, they will come to him whose art is complete and universal, and who has practice. Therefore when they come to you do thus. He will come to you with the measure of his window, the breadth and the length. You will take as many sheets of paper glued together as will be needful for your window. And you will draw your figure first with charcoal, then you will fix it with ink, your figure being completely shaded as if you were drawing it on a panel. Then your master glass-worker takes this drawing and spreads it on a table or board, large and flat, and according as he wishes to colour the draperies, so bit by bit he cuts the glasses, and gives you a paint which is made of well-ground cuttings of copper; and with this paint, with a small-pointed minever brush, piece by piece you paint the shadows on the glass, matching the folds together and the

other parts of the figure according as the master has cut the pieces and laid them together ; and with this paint you can always shade on every kind of glass. Then the master, before joining the pieces together, as is the custom, bakes them moderately in iron cases on hot coals, and then joins them together. You can paint on such glass silk stuffs, hatch and relieve with fine line-work (*vitigare e palliare*), and make lettering, that is, lay a field of the said paint (or colour) and then scratch or etch the drawing (*grattare*) as on a panel. There is this advantage, that it is not necessary to paint the ground colour, as glass can be had of every colour. And if it should happen to you to have to make very tiny figures, or arms, or devices so small that the glass could not be cut, when you have shaded with the above-mentioned pigment, you can paint a few draperies and hatch with oil-colours ; and this need not be baked, neither must it be done, for nothing would be gained by it, but let it dry in the sun as it pleases.

CHAP. 172.—*How mosaic work is done for the adornment of reliquaries, and of the mosaic of quills of feathers and of egg-shells.*

There is another way of working in glass, charming, lovely, and rare as can be imagined, which is a branch of art in devout use for the adornments of holy

reliquaries, and it demands sure and ready design; and this is the manner of the work, thus: take a piece of white glass, not greenish, very clear, without bubbles, and wash it with lye and charcoal, rub it and rinse it again with clean water, and leave it alone to dry; but before you wash it cut it to whatever shape you want. Then take the white of a fresh egg; and with a very clean whisk, break it up, as you do for laying on gold; let it be well beaten, and let it distil for a night. Then take a minever brush, and with the brush and the egg-clear, wet the glass on the back side, and when it is wetted equally take a piece of gold-leaf, which must be thick, that is to say, dead gold (*appannato*). Put it on the parchment tray (*paletta di carta*) and gently put it on the wetted glass; and with a piece of very clean cotton-wool press it gently down, not letting the egg-white get over the gold. And in this way gild all the glass. When it is quite dry, take a very flat tablet of wood, lined with black linen or canvas, and go into your little workroom where no one can disturb you at all, and which should have only one linen-covered window (*finestra impannata*). Put your table at this window as if for writing, so that the window is over your head, and stand with your face turned towards the window; the glass being laid out on the before-mentioned black cloth. Then take a needle bound to a small stick, like a little minever brush, which must

156 The Book of the Art

have a very fine point ; and invoking the name of God, begin drawing lightly with this needle the figure which you wish to make ; let the first drawing be very faint, for you can efface nothing ; so make your drawing light as well as firm ; then go on working as if you were drawing with a pen ; for the whole work is done with the point ; and do you see how you must have a light hand and not tired, for the deepest shade which you can make is only to go with the point of the needle quite down to the glass, and moreover the half shade is just not quite penetrating the gold, which is a delicate matter ; and this work must not be done in haste, but with great delight and pleasure. And I give you this advice : that the day before you wish to work at such works, you should hold your hand to your neck and breast, to have it well rested from fatigue, and moderate in blood.

Having made your design, you must scrape away certain spaces which are usually painted with ultramarine blue in oil. Do this with a leaden style, rubbing over the gold which comes clean away, and cutting sharp round the outlines of the figure. When this is done take other colours ground in oil, such as ultramarine blue, black, verdigris, and lake : and if you wish any garment or lining to gleam with green, (*che risprende in verde*) paint in green ; or with lake, paint in lake ; or with black, put in black. But black has more force and sculptures your figures better than

any other colour: then with something flat beat and press your little figures into the gesso, so that the whole may be quite level. And this is how this work is done.

For this and other fine kinds of work, quills of feathers can be used cut up very small, like millet, and dyed as I have said; you can also make mosaic in this way. Take your egg-shells well crushed (*peste*) but white, and lay a ground of these all over the figure which you have drawn; fill it with these, working as if they were coloured pieces: and then when you have put in the flat colouring with the suitable paints from your colour-box, tempered with a little white of egg, paint the figure bit by bit, just as you would on gesso, but with watery transparent colours (*pur d'acquerelle di colore*); and then when it is dry, varnish it as you varnish other things on planes. For the background of such figures, just as on walls, you should adopt this method, taking gilded or silvered sheets, or thick beaten gold, or thick beaten silver, cut up in very small pieces, and with pincers fill in the ground as you did with your crushed egg-shells, wherever gold is required in the background. Also you can make the background with pieces of white egg-shell, wetting it with whipped white of egg, the same as you put gold on to glass with; wet it in the same way. Put on what gold the background wants, let it dry and burnish with cotton-wool, and this is enough for mosaic or Greek work.

158 The Book of the Art

CHAP. 173.—*The way to work on cloth by printing from a shape in colour (lavorare colla forma dipinti in panno).*

As to the art of the brush yet appertains certain painting on linen cloth used for skirts (*garnelli*) of boys and children, and for certain church adornments (*leggi*), this is the way to do them.

Have a frame made, as if for a linen-covered window, two ells (*braccio*) long, and one ell wide, covered on the laths with linen, or canvas. When you want to paint your linen (*pannolino*), any quantity, six or twenty ells, roll it all up, and put the top end of the stuff upon the frame; also have a board of walnut or pearwood, any way of a strong kind of wood, the size of a brick, which tablet must have designed and hollowed on it a wide band, in which must be designed, in the manner of any sort of silk stuff you like, either leaves or animals; and let the design be so arranged and engraved on the block that all four faces may match together to make a complete and connected pattern, and there must be a handle to be able to lift it. Put it on the other surface which is not engraved (*intagliato*). When you want to work take a glove for the left hand, and first grind some pine charcoal, very finely, with water. Then having thoroughly dried it at the sun or fire, grind it again dry, and mix it with liquid varnish, as much as is

needful; and with a small ladle (*mestoletta*) take some of this black and spread it out on the palm of the hand, that is, over the glove; and so smear it on the board where it is engraved, carefully, so that the engraving is not choked. Now, begin putting it (the engraved tablet) regularly and equally upon the cloth stretched upon the frame, putting it underneath; take in the right hand a shield-shaped board (*scudella or scudellino*), and with the back of it rub hard over the part where the tablet is engraved; and when you have rubbed, till you are sure that the colour must be well incorporated with the cloth or linen, remove your block, put pigment on it again, and very methodically replace it, till the whole piece of stuff is quite full. This kind of work requires to be arranged with some filling colour in parts, to look gayer; therefore you must have colours without body, such as yellow, red, and green. Yellow: take saffron and beat it well on the fire, and temper it with very strong lye. Take a soft, blunt-pointed bristle brush, spread the painted cloth on a table or panel (*tavola*) and plan this colour on the animals, and figures, and foliage, as seems good to you. Next take Brazil lake (logwood) scraped with glass; put it to soften in lye; boil it with a little rock-alum; let it boil a little while, so that it may have its full crimson colour. Take it from the fire that it may not spoil; then with the same brush plan this out in the spaces as you did with the

160 The Book of the Art

yellow. Then take verdigris, ground in vinegar, with a little saffron, tempered with a little not strong size. Plan this into the spaces as you did with the yellow and other colours, and let them be arranged as one sees in the different creatures, yellows, reds, greens, and whites.

You may also for this work burn linseed oil, as I explained previously, and temper this black, which is an extremely fine powder, with liquid varnish; and it is an extremely good and fine (*sottile*) black: but it costs more.

And the same kind of work can be done, on green, red, black, yellow, blue, and light blue (*biava*) cloth. If it is green you can work with minium (red lead) or cinnabar (vermilion) ground finely with water. Dry it, powder it with liquid varnish. Put this colour on your glove as you did with black, and work in the same way. If it is red cloth, take indigo and biacca ground finely with water; collect it and dry it in the sun, then powder it: temper it with liquid varnish in the usual way, and work in the same way as you did with black. If the cloth is black, you can work upon it with light blue (*biava*), that is, plenty of biacca and a little indigo, mixed, ground, and tempered, according to the custom which I have described to you for the other colours. If the cloth is light blue, take biacca ground and dried again, and tempered according to the method used for the other colours. And

speaking generally, according as the grounds are, you can find variations of these colourings, lighter or darker, which to your fancy it seems you can put together, and one thing will teach you another, both by practice, and by the knowledge given by your intelligence. The reason? that every art is in its nature ingenious and pleasing: *chi ne piglia se n'ha* (he that takes, hath). And similarly the contrary happens.

CHAP. 174.—*To overlay a stone figure with burnished gold.*

It befalls at times that the worker in one art seeks to know fully how to work at everything, especially at things which can bring honour. Therefore I will explain to you such a thing, not so much that it is usual, as because I have tried it myself. So should there come to your hands a stone figure either large or small, and you should wish to overlay it with burnished gold, follow this method. Dust and clean your figure thoroughly; then take ordinary size, that is, the same with which you temper the gesso for panels, and make it boil well; and when it is boiling put some over this figure once or twice, and let it get quite dry. After this take oak—male oak (*rovere*)—charcoal; pound it; take a tammy sieve (*tamigio*) and sift away the powder from the charcoal. Then take a small sieve which grain such as millet (*miglio*)

162 The Book of the Art

would pass through, and sift this charcoal, and put these siftings aside, and in this way make as much of it as is sufficient. This being done, take cooked linseed oil, made properly for making mordants, and mix in it a third part of liquid varnish. Then make everything boil well together. When it is very hot, take a vessel and put into it the small-sifted charcoal: after that put in this mordant: mix them well together, and with a hog's-bristle, or big minever brush, lay it on equally in every part over the whole figure or other object. When you have done this, put it into a place where it will dry thoroughly, either in the wind or in the sun, as it pleases you. Your figure being quite dry, take some of the same size, and put into, say, a glassful of it, one yolk of egg; mix these well together, quite hot; take a piece of sponge, dip it in this tempera, not filling the sponge too full, dab and rub over every part where you have put on the mordant with the charcoal. To explain to you why you put on such a mordant, the reason is this: Because the stone always holds some moisture; when the gesso tempered with size feels this, suddenly it rots and splinters and spoils; therefore this oil and varnish is the material and means of making the gesso agree with the stone, and I will explain the cause to you. The charcoal always keeps dry against the humidity of the stone. Then wishing to continue your operations; take gesso grosso, tempered with size in the manner

that you primed the flat part of a panel, except that, according to the quantity, I wish you to put in one, two, or three yolks of egg, and then with a spatula (*stecca*) put it all over your work ; and if you mix with these things a little powder of pounded bricks, it will be so much the better ; and put this gesso on with the *stecca* two or three times, and let it get quite dry. When it is perfectly dry, scrape it and clean it, as you did the panel. Then where you want gold, take gesso sottile, and grind and temper this gesso with the same size as you did in grounding a panel ; except that now it is necessary to put some yolk of egg, not so much as you put with the gesso grosso ; and begin putting the first coat of it on your work, rubbing it perfectly smooth with the hand. Over this coat put on four to six more with the brush, as you laid the gesso on the panel, in the same manner, and with the same care. This done, and well dried, scrape it lightly ; then put on tempered bole, the same as on a panel, and observe also the same method of putting on gold, and of burnishing with the stone or tooth. And this is as important a part of this art as can possibly be. And if it happen that any of your work, thus overlaid with gold, has to run the risk of getting wet, you can varnish it ; it is not so beautiful, but much stronger.

164 The Book of the Art

CHAP. 175.—*In what way the damp of a wall may be remedied, where painting has to be done on it.*

It falls within the scope of this same art, to be obliged sometimes to find a remedy where paintings are done on damp walls: to provide which judgment and experience are necessary. You must know that damp operates on a wall, as oil does on a panel: as damp corrupts lime, so oil corrupts gesso and its temperas; and it is clear that this damp may do great injury. As I told you before, the most noble and most enduring tempera there can be on a wall is working in fresco, that is, upon the fresh lime; and know that in front on the face of the wall, rain may pour down, and will never do any harm; but rain behind on the other face of the wall is the very mischief (*forte dannifica*), or indeed every drop that falls on the uncovered top of the wall; but you can find a remedy, namely: first to examine the place where you are going to work and see whether the wall is sound, and have it perfectly well covered (coped?). And if it is in a position where water goes in a conduit which cannot be diverted, adopt this plan. Whatever stone the wall is built of, take linseed oil cooked as for mordants, mix and grind it with pounded bricks; but first with a brush or rag put on the wall a coat of very hot oil or mordant. Afterwards take this paste of pounded bricks and lay it on the wall,

so as to leave a very rough surface (*rasposo*); let it dry for some months until it is very dry, then with a trowel take very fresh lime prepared with gall nuts (*calcina ben fresca di galla*), as much lime as sand, and mix with it sifted powder of pounded bricks, and plaster with this very carefully once or twice, not worrying the plaster, and leaving it with a roughened surface. Then when you want to paint and work upon it, plaster it with your fine intonaco, as I explained to you before about the way to work on walls.

CHAP. 176.—*Of two other methods useful for the same purpose.*

For the same: first take boiling ship-pitch and rub it well into the wall. When you have done this, take the same pitch (*pegola o pece*—i.e. coarse natural turpentine resin), and take dry new bricks, pounded; in same way pound them and incorporate them with the said pegola; put some all over the wall, that is, wherever there is any damp, and beyond. This is a very perfect cement (*smalto*). Put on the roughing with lime, as I told you and explained before.

Again, for the same purpose: have a quantity of boiling liquid varnish, and put a priming on the face of the damp wall, and then put on pounded brick mixed with this varnish; this is a very perfect and good remedy.

166 The Book of the Art

CHAP. 177.—*Of painting rooms or loggie with verde-terra in secco.*

Sometimes rooms are decorated or beneath loggie or balconies, which is not always done in fresco; for the plastering may have been done a long time. If you wish to work in green, take verde-terra well ground, and tempered with grounding size, not too strong, and put it on two or three times over the whole ground with a big bristle-brush; when you have done this and it is dry, draw with charcoal as on a panel, and outline your designs with ink or if you like with black paint, that is, vine-charcoal well ground and tempered with egg, or if you like with the yolk and white of the egg together. Having brushed away the charcoal, take a large pan or basin of water, or if you like 'metadella' (scoop, pint), as they say in Tuscany. After that put in as it might be a spoonful of honey, and beat it all well together. This being done, take a sponge, and dip it in this water; squeeze it a little, and go with it over the whole ground which has been laid in with green; then with a water-colour of black, put on your shadows very delicately, transparent and well softened. Then take biacca ground and tempered, with the said tempera of egg described above, and draw the figures in with white, as is required in this kind of art. Then on these figures you can put some colouring (*coloruzzo*)

differing from the green, as ochre, cinabrese, and orpiment, and adorn with borders and also put on backgrounds of azure. And note that this kind of work can also be done on panels, or on walls in fresco, plastering, and then putting in the ground with this verde-terra, and doing the white drawing with bianco sangiovanni.

CHAP. 178.—*How a panel painted with verde-terra can be varnished.*

You will find some persons who will require you to varnish panels which they have got you to paint in green. I tell you that it is not the custom, and that verde-terra does not require it; but oblige them if they want it. So adopt this method: take scrapings of parchment, boil them well with clean water, to make size, the usual tempera, then with a large minever brush, pass it two or three times over your figures or scenes, wherever you mean to varnish it. When you have given two coats of the size, which must be very clear and bright, and which you must strain twice, let your work dry for the space of three or four days. Then you may pass your varnish safely over the whole, and you will find that verde-terra in this way will take varnish the same as other colours.

168 The Book of the Art

CHAP. 179.—*How, having painted a human face, to wash off and clean away the colours.*

Sometimes, in the practice of art, it will happen to you to have to tint or paint on flesh, especially to colour the face of a man or of a woman. You may temper your colours with yolk of egg, or if you desire, for the sake of counterfeiting,¹ with oil, or with liquid varnish, which is the most powerful tempera there is. But should you wish to remove the colours or tempera from the face, take the yolk² of an egg and little by little rub it on the face with the hand; then take clean water that has been boiled on bran, and wash the face with it; then take more of the yolk of egg, and again rub the face with it, and again wash it with the warm water. We will not talk of this subject any more.

CHAP. 180.—*Why women should abstain from using medicated waters on their skins.*

It might happen in the service of youthful ladies, especially those of Tuscany, to have to make some colour of which they are desirous, and use to make themselves beautiful, and certain waters. But the Paduan women do not use them, and not to give

¹ Perhaps for actors and mimics.

² Yolk of egg is a solvent to some resins.

them cause for finding fault with me, and as it is also displeasing to God and our Lady, I shall be silent. But I advise you, if you desire to preserve your complexion for a long period, to be accustomed to wash yourself with water from fountains, rivers, or wells; and I warn you that if you use any artificial preparation, your face will soon become withered and your teeth black, and in the end women get old before the natural course of time, and become the ugliest old hags possible. This is quite sufficient to say on this subject.

CHAP. 181.—*Showing how useful it is to take casts from the life.*

Now it seems to me that I have said enough on colouring of all kinds. I will now touch upon another subject, which is very useful, and gains honour for your drawing in portraying and imitating natural things.

CHAP. 182.—*How to take a cast of the face of a man or woman.*

Would you take a cast of the face of a man or woman, of whatever rank? Then adopt this method. Let a young man, or woman, or an old man come to you, and let the beard be shaved; for the hair and beard are difficult to do. Then with a large minever

170 The Book of the Art

brush anoint the face with some oil of roses, or other sweet-smelling oil; put on the head a cap or hood, and provide a band, about a span wide and as long as from one shoulder to the other, going round the head over the cap, and sew the edge of it round the cap (*beretta*) from one ear to the other. Put into the hole of each ear a piece of cotton, and having drawn the edge of the said band tight, sew it to the end of the collar and give a half-turn in the middle of the shoulder, and turn it to the buttons in front. Do the same to the other shoulder, then unite the ends of the band. Having done this, place the man or woman flat on a carpet, a table, or large board. Get a hoop of iron of the width of one or two fingers, with some teeth above like a saw. Put this hoop, which is to be two or three fingers longer than the face, round the face of the person; let it be held by your associate, suspended away from the face, that it may not touch the person. Take the band and turn it round and round, putting the end of it which had not been sewn into the teeth of the hoop, then fastening it between the flesh and the hoop, so that the hoop shall be beyond the band, and leave about the width of two fingers or less between the band and the flesh, according to the thickness you wish the casting to be, for I tell you this is where you have to throw the plaster in.

CHAP. 183.—*How to enable a person to breathe, from whose face a cast is being taken.*

You must get a goldsmith to make two small tubes of brass or silver, which are to be round above, and more open below, like a trumpet, each about a span long, and as large round as a finger, made as light as possible. The other end must be made the same shape as the nostril, but just so much smaller as to enter the nostrils, fitting them exactly, without forcing the nose open at all. Let a small hole be pierced through the middle of each, and bind them together. But at the foot where they enter the nose, let them be fixed firmly at the same distance from one another as the distance there is from one nostril to another.

CHAP. 184.—*How the mould is thrown in gesso from the living person, and how it is taken off, and how it is cast in metal.*

This being done, let the man (or woman) remain lying down, and let him put these tubes into his nostrils and hold them himself with his hand. Have prepared, some Bolognese gesso or volteranno, burnt, fresh, and well sifted. Have near you some tepid water in a basin, and quickly put this gesso into this water. Do it quickly, for it sets quickly, and make it neither too liquid nor too little so. With a drinking

glass, take some of this mixture, and pour it round the face. Cover it equally, but keep the eyes to cover last of all the face. Make him keep his mouth and eyes closed; not squeezed tight, which is not necessary, but as if he slept, and when the space is filled up to a finger's-breadth above the nose, let it remain quiet a little while till it is ready. And bear in mind, that if the person from whom you are taking a mould is of high rank, as a lord, a king, a pope, an emperor, you must mix the gesso with tepid rose-water; and for other persons, any spring, well, or river water, tepid, suffices.¹ When your plaster is dry and set, gently with pen-knife, knife, or scissors, unsew all round the band which you sewed on: draw out the tubes from the nose carefully, make him get up and stand or sit, and he himself holding the plaster which is over his face, managing his face carefully, draw him out of this mask or mould. Set it aside and keep it carefully. This part of the task being accomplished, take a child's bandage (*fascia da putti*) and wind it all round the mould so that the bandage² projects two fingers'-breadths beyond the edge of the mould. Take a large minever brush; and with whatever oil you like, anoint the inside of the mould with great care, so that you may not accidentally injure any part,

¹ Plaster of Paris is usually mixed with very thin size to prevent the casting setting too rapidly.

² (Swaddling band?).

and mix the plaster the same as before; and if you would mix with it some pounded brick it would be a good deal better. Then with a glass or porringer take some of this gesso and put it into the mould, and hold it over a bench, so that as you put in the gesso you tap the mould lightly with the other hand on the bench, so that the gesso should be caused to enter equally into every crevice, as sealing-wax fills the seal, and that there should be neither bubbles nor hollows. When the mould is full, let it alone for half a day, or, at most, one day. Take a small hammer, and with care, feel and break the outside husk, that is to say the original mould, but in such a way that neither the nose nor anything else may be broken. To make the mould easier to break, before you fill it, take a saw and saw it in several places on the outside. But mind not to saw through, which would be a misfortune. You will then be able, when it is full, to break it dexterously in pieces with light strokes of the hammer. Thus you will have the effigy or physiognomy or cast of that great lord. And know that once you have got such a mould, you can cast from it with copper, metal, bronze, gold, silver, lead, and indeed with any metal you wish. But get capable masters, who understand founding and casting.

CHAP. 185.—*How to take a mould of the whole figure of a man or woman or an animal, and to cast from the mould in metal.*¹

You must know that in the above way, following the best teaching, I inform you that you may mould and cast the whole figure, like the many naked antique figures which we find. You must get a naked man or woman, and let the person stand upright in a sort of box or case, which will reach as high as the chin, and let the case be joined together, or rather let it come apart altogether in the middle of one side and down the length of the other. Let a very thin copper plate be placed against the middle of the shoulders, beginning at the (level of) the ears down to the bottom of the case, and let it follow the outlines of the naked person's body without hurting him, just not touching the flesh; and let this metal sheet be fixed in the corner where the case is joined together; and in this way fix four sheets of metal going to the corners of the chest. Then grease the naked person, put him upright into the case; mix a quantity of plaster abundantly with tepid water, and take care to have an assistant with you; and while you pour the plaster in front of the man, let the assistant fill the back part

¹ This chapter is very difficult to understand and translate. I think the directions are insufficient or the process unworkable. The mould would not come away from the body without one or the other being injured.

at the same time, so that it may be filled to his throat; with regard to the face, you may do that another time, as I have told you before. Let the plaster rest until it is quite stiff; then open the case where it is joined, insert tools and chisels into the corners where the copper or iron plates join the case, and open it like a nut, holding on either side the sides of the case with the mould you have made.¹

Withdraw the naked person very gently from it; wash him carefully with clean water, for his flesh will be as red as a rose. And as when you moulded the face, you may make a cast with any metal you please; but I recommend you to make it of wax, for this reason, that the mould may be broken without the figure sticking to it, and you may take away and add, and make any repairs where the figure is defective. After this you may join the head on, and make a cast of the whole person. You may similarly cast any member separately, an arm, a hand, a foot, a leg, a bird, a beast, or any kind of animal or fish. But the animals must be dead, because they have neither the sense nor firmness to stand still.

¹ Adhering to each side of the case, I suppose, and divided into sections by the copper plates.

176 The Book of the Art

CHAP. 186. — *How to make a mould from your own body, and then cast from the model in metal.*

You may also make a model of a person in this manner. Have made a quantity either of mixed plaster (or dough) or wax, well stirred and clean, of the consistence of ointment and very soft; spread it on a large table (board) such as a dining-board (*i.e.* the top without the trestles), and put this on the ground. Spread the plaster (or dough?) or wax on it to the height of half a braccio. Then throw yourself upon it in any attitude you please, either forward or backward, or on one side. And if this paste take the impression well, you must get yourself extricated from it dexterously quite straight, so as not to pull it about. Then let the mould dry. When dry you may cast from it with lead. Do the other side of your person (the opposite side to that which you have done) in the same manner. Then join them together, and fill them both with lead or other metal.

CHAP. 187.—*To make moulds of small figures in lead and to multiply the plaster casts.*

If you would make casts of small figures in lead or other metal, oil your figures, take impressions in wax and cast from them with anything you please; also, if

on your panel you want something in relief, such as heads of men, lions, or other animals or small figures. Let the mould you have made in wax dry; then oil it well with salad or lamp-oil. Take gesso sottile or gesso grosso ground with a little strong size. Fill the mould with this warm plaster and let it cool. When cold, separate the plaster a little from the mould with your knife. Blow very hard upon the separated part. Take up your little figure (*figuretta*) with your hand, and it is done. And in this manner you may make as many as you like. Keep them, and remember that they are better made in winter than in summer.

CHAP. 188.—*How to make impressions of medals (santelene)¹ in wax or paste.*

You may, if you please, take impressions of coins in wax or plaster. Let them dry and then melt some sulphur and fill these moulds with it, and it is done; but if you would cast with plaster mix with it some ground minium, that is to say, some of the dry powder with the paste, and make it of the consistence which suits you.

¹ *Santalina*—any sort of medal bearing the image of a saint, because anciently it was generally the countenance of the Empress St. Helena.—*Milanesi*.

178 The Book of the Art

CHAP. 189.—*How to take impressions of a seal or coin, with a paste made of ashes.*

If you would take very perfect impressions of a seal or ducat, or any other money, adopt this plan, and set great value on it, for it is an excellent method. Take a basin half full of clean water, or quite full, as you please. Take half a pipkin full of (wood) ashes. Throw them into the basin, and stir them with the hand. Let the mixture rest a little, and before the water becomes quite clear, throw it into another basin; do this several times, and I recommend you to put in what ashes you want at the first. Then wait until the water is quite clear, and the ashes settled at the bottom. Draw off the water, and dry the ashes in the sun, or as you please. Then grind them with salt dissolved in water, making a sort of plaster. Then on this paste take impressions of seals, medals (*santelene*), figurines, coins, or in general of anything of which you desire impressions. This done, let the paste dry gradually without sun or fire. You may pour on this paste melted lead, silver, or any metal you please, for the paste is sufficiently tenacious to bear a great weight.

CONCLUSION

Praying that the most high God, our Lady, St. John, St. Luke the evangelist and painter, St. Eustachius, St. Francis and St. Anthony of Padua may give us grace and strength to sustain and bear in peace, the burdens and fatigues of this world; and that to whomsoever may study this book, they will give grace to study it well and remember it, so that by the sweat of their brows, they may live peaceably, and maintain their families in this world with grace, and finally in that which is to come, in glory, *per infinita secula seculorum*.

Finito libro referamus gratias Xpo 1437.

A dì 31 d luglio ex Stincarum ec.

Note.—In the *Codex Riccardiano*, in place of “Finito libro ec.,” we find :—

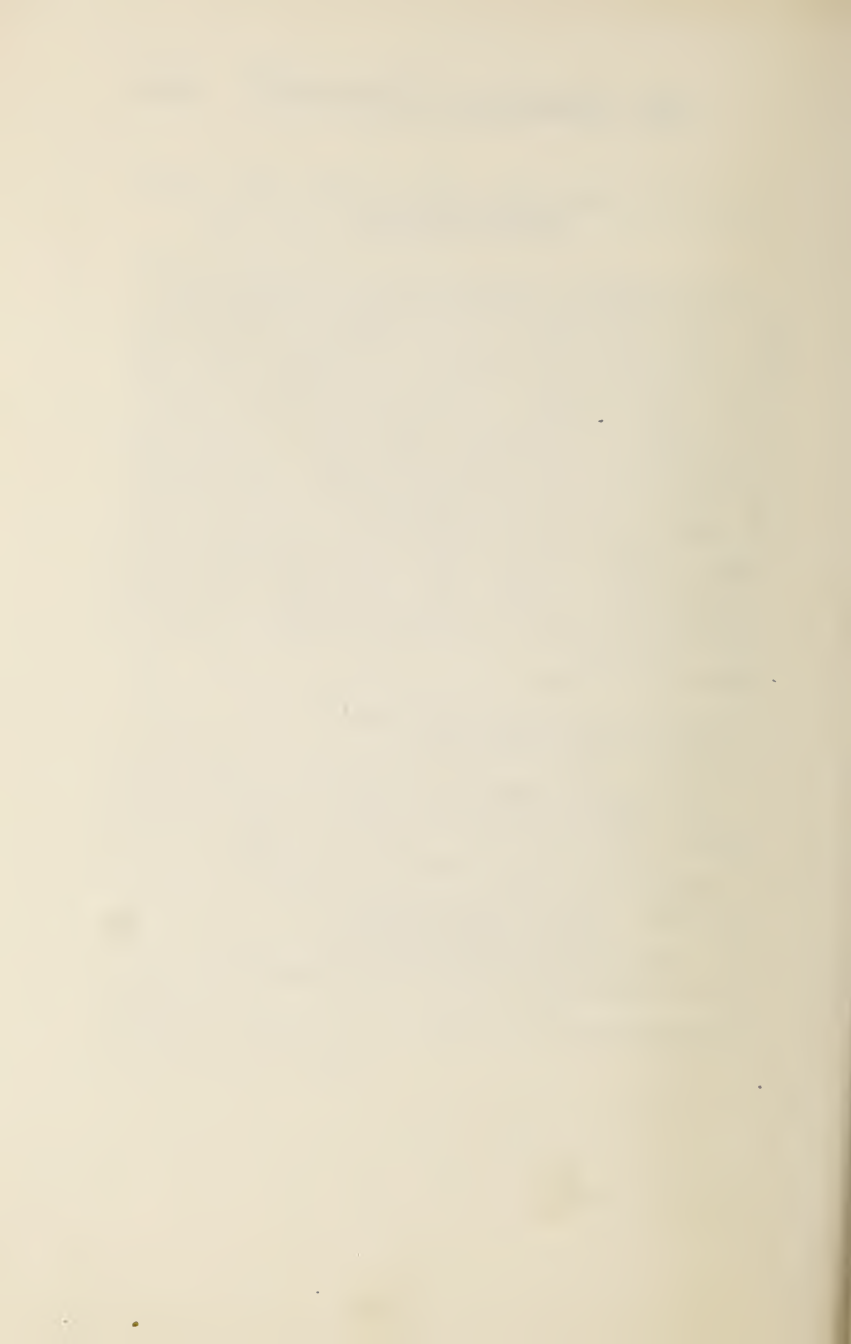
“Laus Deo et beate Marie semper Virgini.”

“Concorda il tuo voler con quel di Dio

E verra ti compiuto ogni disio

Se povertà ti stringe o doglia senti

Va in su la croce a Christo per unguenti.”



NOTES ON MEDIÆVAL
METHODS

THAT ITALIAN TEMPERA WAS YOLK-OF-EGG PAINTING

AT the present time most interest will be felt in the tempera teachings of the *Trattato*, as it is the earliest work that really treats of this way of painting—written when in Italy practically all pictures were painted in this way or in fresco. Later writers write only much later when it was superseded by oil. Vasari uses the word “tempera” as equivalent to yolk of egg; so do Armenini and others; and when a picture is said to be painted in tempera, this is strictly what is meant, though size was used as an occasional adjunct. It is not always easy, or even possible, to say whether a varnished tempera picture is tempera or not, and Ruskin once admitted that he had for a long time been holding up for admiration as the finest oil-painting what he finally discovered to be tempera. Till recently Vasari’s statements about the method employed by each painter have been accepted almost without question, but also without intelligent comprehension.

Cennino used the simple yolk of egg for panel-painting and for fresco secco, and for the latter, thought less well of the whole egg diluted with fig-milk. Vasari,

writing when tempera was nearly obsolete, only used by archaic Greek ecclesiastical painters, makes an addition to the vehicle, which may perhaps be accounted for by his describing what was still in common use for the secco finishing of fresco. These 'Greeks' and the early successors of Cimabue tempered their colours "with yolk of egg or *tempera*, which is this: they took an egg and they beat it up, and with it they ground the tender branch of a fig, so that milk with that egg made the tempera of the colours with which they painted their pictures,"¹ being exactly Cennino's way of preparing the whole egg for secco. I have not found a single other instance of the milk of fig-shoots being added to the yolk of egg, though occasionally it was mixed with the whole egg or with the white used alone. It acts as a solvent. Neither does wine seem to have been much used or vinegar, except with both white of egg and gum in missal-painting. Wine was sometimes used alone to dilute certain transparent colours both in missal-painting and in fresco. In the addenda to Theophilus of the Harleian Codex (B.M.) wine is recommended as an addition to egg for a few colours. This refers to painting in books. Blue $\frac{1}{2}$ wine with the glaire or white of egg. Greek green (verdigris) yolk and mead or wine and water. Blue earth (?) yolk and white with wine and water. In the accounts quoted by Eastlake of the painting of the Mews at La Cherringe (Charing), a large establishment, where the King's Falconers resided, there is the only specific entry of eggs being bought for painting

¹ *Introduzione alle tre Arti* (Vasari).

that seems known at all. Besides eggs a large quantity of white wine, size, and honey were bought for the painters. We cannot tell how these things were mixed. Honey and vinegar were used to mix with size. (See Strasburg MS.)

Vasari alludes in the *Introduzione* to the occasional use of size instead of egg. In his notice of Cennino in the Life of Agnolo Gaddi, he says that he "wrote with his own hand on the methods of painting in fresco, in tempera, in size, and in gum," each being evidently considered by him a distinct process. It is probable that very small stippled painting like Fra Angelico's, or like our Wilton Triptych and the Westminster Retable, may have been done with white of egg alone, or in combination with gum. The cracking of the latter (the Retable) is not at all like yolk of egg. The paintings in Cologne by Meister Wilhelm (?) could not, I think, be reproduced by yolk-of-egg tempera.

We should hesitate before throwing doubt on Vasari's consistent statements that nothing had been found that gave tempera the blending and slow-drying qualities of oil. All attempts at such mixtures with the egg failed. A passage in the Life of Antonella da Messina proves this, and points out the recognised shortcomings of the method: "Continuing to work on panels and on cloths not otherwise painted than in tempera, which method was begun by Cimabue in 1250 when he was in company of those Greeks, and then continued by Giotto and others, about whom we have been telling so far; they went on with the same

method although the painters knew that in these tempera pictures the work was lacking in a certain softness and vivacity which, had they attained to it, would have given more grace to the design, more charm to the colouring, and greater ease in blending the colours together, for they had been accustomed to hatch their work with the point of the brush. But although many had, reasoning on it, searched for such a thing, no one had found any good way, neither by using varnish nor other kinds of colours¹ mixed with the temperas. And among many who tried such things but in vain were Alessio, Baldovinetti, Pesello, and many others, and none of these succeeded in producing works of that beauty and goodness which they had imagined. And even if they had found what they sought, the method was wanting to them of rendering figures on panels durable like those on walls, also the way to wash them without removing the colour, and that they should stand concussion in being handled. Many artists, meeting together, had frequently discussed these things without result."²

It seems, therefore, more than probable that the soft and blended and even transparent effects, where the tempera painters really attained the possible loveliness of their technique, were the result of skill in handling and were not produced by mixtures with the egg-vehicle or by any substitute. Evidence is against,

¹ The word *colore* was not strictly limited to a coloured pigment, but sometimes meant any substance used in making up a compound to be applied with a paint-brush.

² Translated from Milanese's Vasari (Life of Antonella da Messina).

not for Sir Charles Eastlake's and similar conjectures that these quantities were obtained by the addition of something to make the egg dry slowly. I imagine he was probably thinking especially of Filippo Lippi's Annunciation (presented by him to the nation), admirable in all these qualities, but perfectly to be rendered with egg-tempera, when he says:¹ "The paintings of Filippo Lippi, at once finished and free, indicate the use of a medium which did not dry rapidly (tempera does). This requisite in the tempera vehicle may have been secured not merely by the mixture of honey, (which Eastlake severely condemns as used to make grounds pliant according to the early Anglo-German process), but by the combination of wax with glutinous vehicles, as exemplified in Le Bègue's receipt."

Egg *sets* rather than dries, and to be solid must be painted and left undisturbed. Honey was principally used to mix with gum and white of egg in miniature painting. Its moisture-attracting properties would prevent these from becoming too harsh and hard for the pages of a book. For the same reason probably it was used in the gesso grounds under the gilding on parchment. I cannot recall that it was ever used with yolk of egg. The combination of wax and size is only met with in two recipes (see p. xxxiv). The objection to seriously considering any size mixture as a vehicle for fine work is the clogging of the brush, but that it was used to some extent in the very same picture with yolk of egg is certain. We need not go further than Cennino for proof.

¹ "Materials," note to p. 219.

This Annunciation of Filippo's may be taken as a guide in tempera technique. The effects are just what tempera can do; they are the natural beauties of the method.

I do not believe for a moment that the dissatisfaction which Vasari says the painters felt was universal. Much of the painting of the fifteenth century has that intrinsic beauty which comes when we enjoy the material we work with, and feel that we have in our hands the means of success, and are not desirous of other means. The northern innovations certainly perplexed and startled the Florentines at first, they were better understood in Venice; there they quite altered the character and aims of painting. Pollainolo's St. Sebastian, for instance, in our National Gallery is certainly painted with oil colours; but they are handled like tempera colours, and the technique—coarsely hatched oil—is to me decidedly displeasing: the general effect is like tempera covered with a discoloured varnish. What painting would have resulted from the humanising tendencies of the Renaissance—how would art have developed, if only the old materials had continued in use? There can be no doubt that the influence of oil-paint was a very profound one, very largely owing to the wide spaces of luminous, mysterious shadow which it made possible, and the encouragement it gave to realistic effects by the great ease in producing them. For some reason, for which it is difficult to give a satisfactory reason, there is no doubt that while fresco and tempera produce a decorated space in itself pleasant, and figures and other

objects can be suggested in slight chiaroscuro without appearing unfinished or crude, this is not the case in oil-painting, which seems incapable of giving this pleasantness to the surface of a wall, and requires a completeness in values, tones, and tactile qualities which make the spectator look into the picture and forget the surface. Therefore the one art is monumental, where the surface must not be forgotten or obliterated, and the other is on the whole opposed to monumental painting.

Oil once discovered, or rather the way to use it becoming known and general, it was, no doubt, found to be very convenient. A few years ago I had an interesting conversation with Mr. Spencer Stanhope in Florence, about tempera. He must have been almost the first to return to this method, and has painted principally in it for many years.¹

As he puts it, tempera-painting *quâ* painting has never had a decadence, but was suddenly arrested in the full tide of youth, by the substitution of oil-painting. His opinion was that it had been given up principally because it was difficult and troublesome, rather than because of any inferiority. Vasari constantly exalts oil-painting at the cost of the depreciation of tempera-painting, but he grants that besides being beautiful it was a convenience. "This discovery of painting in oil was a fine

¹ Two early pictures of his in the possession of Mrs. Rae at Birkenhead afford an instructive comparison. An oil picture is rent by deep fissures—cracks is too mild a word. A tempera picture is as fresh as if just painted.

invention and a great convenience for the art of painting."¹

The sweetness and purity of the earlier tempera was hardly appreciated till our own times. Vasari attributes superiority in these points to the rival art. "This manner of colouring lights up the colours better, neither does it need anything but diligence and love, because oil by its own virtue makes the colouring softer, sweeter, and more delicate, and union and blending are easier," &c. Vasari is continually half-apologetic when he is describing the work of those to-be-pitied painters who lived before the great discovery; as for example when, in speaking of a picture by Domenico Ghirlandajo, he says, "than which nothing better could be executed in tempera." He had the most unbounded admiration for fresco on account of the breadth and boldness it required, and of its supposed durability, rather than for the more refined qualities of colour and drawing which it possessed in common with tempera. He might have thought more highly of tempera if he had known that it has equalled these other methods in permanence, if even it has not excelled them. Van Eyck's painting seems only to have interested him on account of its mysterious gloss, which dispensed with a final varnish, and from its having initiated the great revolution in technique. Its secret was unrevealed—what was used, and how it was used. *Tempera*-painting was no mystery; "all those details which

¹ "Fu una bellissima invenzione e una gran commodità" (*Introduzione*, cxxi.).

were held to be rare and profound secrets in Cennino's day being perfectly well known to all artists in these our times."

But the secret of using the secrets was lost already. Flemish and German panel-painting with varnish in the fifteenth century, and Italian panel-painting with yolk of egg were two contemporary and parallel developments of the new art-impulse, each offering a unique and unsurpassed phase of technique and thought. Tempera was not unsatisfactory to the aims of fifteenth-century art. It was capable of expressing a kind of unfleshy beauty which is not easily given with oil paints. Many of the Italians gave up their accustomed tempera reluctantly, wedded as it was to all their artistic desires and conceptions.

The qualities aimed at by the early painters, both in fresco and in tempera, but especially by the tempera painters, are well expressed in this passage from Ruskin's writings, in the *Quarterly Review*, 1847:—

"It is to be remembered that the painter's object in the backgrounds of works of this period (universally or nearly so of religious subjects) was not the deceptive representation of a natural scene, but the adornment and setting forth of the central figures with precious work: the conversion of the picture as far as might be into a gem, flushed with colour and alive with light. The processes necessary for this purpose were altogether mechanical; and those of stamping and burnishing the gold, and of enamelling, were necessarily performed before any delicate tempera

work could be executed. Absolute decision of design was therefore necessary throughout; and hard linear separations were unavoidable between the oil-colour and the tempera, or between each and the gold or enamel. General harmony of effect, aerial perspective (the effect of distance given by imitating the influence of the atmosphere or deceptive chiaroscuro) became totally impossible; and the dignity of the picture depended exclusively on the lines of its design, the purity of its ornaments, and the beauty of expression which could be obtained in those portions (the faces and hands) which, set off and framed by this splendour of decoration, became the cynosure of eyes. The painter's entire energy was given to these portions, and we can hardly imagine any discipline more calculated to ensure a grand and thoughtful school of art than the necessity of discriminating character and varied expression imposed by this peculiarly separate and prominent treatment of the features. The exquisite drawing of the hand also, at least in outline, remained, for this reason, even to late periods one of the crowning excellences of the religious schools. It might be worthy the consideration of our present painters whether some disadvantage may not result from the exactly opposite treatment now frequently adopted, of finishing the head before the addition of its accessories. A flimsy and indolent background is almost a necessary consequence, and probably also a false flesh-colour, irrecoverable by any after apposition."

Another passage, from "Modern Painters," may be

said to be in praise of tempera, for is it not the lost art which is here spoken of. Clay and oil is unfortunately often too literally true (see p. 214).

Of the truth of the open sky.

"But there are some skies . . . introduced merely as backgrounds to the historical subjects of the older Italians, which there is no matching in modern times; one would think that angels had painted them, for all is now clay and oil in comparison. It seems as if we had totally lost the art, for surely otherwise, however little our painters might aim at it or feel it, they would touch the chord sometimes by accident; but they never do. . . . But, however they are obtained, the clear tones of this kind of the older Italians are glorious and enviable in the highest degree; and we shall show, when we come to speak of the beautiful, that they are one of the most just grounds of the fame of the old masters."¹

¹ "Modern Painters," I. 207.

EXPLANATION OF THE TEMPERA- PAINTING OF THE 'TRATTATO'

CENNINO'S method of painting with egg will not be understood by a mere superficial reading. I have therefore put together the various hints as I understand them myself. Cennino does not set a very high value on his own book as capable of giving satisfactory instruction. "There are many who say they have learned the art without having been with a master. Do not believe them, for I give you this very book as an example: even studying it day and night, if you do not see some practice with some master, you will never be fit for anything, nor will you be able with a good face to stay among the masters" (c. 104). Any one, however, now wishing to learn tempera-painting must try to work according to its instructions, and will learn best by trying to reproduce faithfully some fine piece of old work. The manipulation of tempera colours is by no means easy. It is necessary to form an ideal of the kind of quality attainable, and to practise the attainment of it. Fine quality in tempera is difficult to understand and produce, just as in oil-painting of different kinds—Flemish, Venetian, or others.

It was not the breadth and simplicity of fresco that attracted Cennino most strongly, but the daintiness

and finish of tempera on panels. We naturally suppose from the whole tenor of his writing that he was a skilled craftsman, but not an artist of the first rank intellectually. He delighted in the ivory smoothness of the ground (cc. 120, 121), in the glow of the highly worked colouring (end of 145 and 146), and of the embossed and engraved gilding (96, end of 138). To all these he begins to introduce us in chapter 103. "But we will return, however, to our colouring, and from walls pass to panels, or *ancone*, which is the pleasantest and neatest part of our art; and bear in mind that he who should learn to work first on walls and then on panels will not become as perfect a master in the art, as who should happen to learn first on panels and then on walls." The next chapter is headed (c. 104) "In what manner to acquire the art of working on a panel," or we might translate, "of painting a picture on a panel." Here, however, we only find how to make size to mix with the gesso, and the processes of priming and polishing and gilding and painting itself are not described till chap. 145. "Panels are painted just as I explained to you to work in fresco, with three exceptions. One is, that you must always paint the draperies and buildings before the faces. The second is this, that you must always temper your colours with yolk of egg, and they must be thoroughly tempered, as much yolk as of the colour which you temper. The third is, that the colours must be finer, and well ground like water." This, I take it, means that they are to be ground into an impalpable and liquid paste. As

we find in the directions for grinding colours (c. 36) that when ground they are to be kept in vessels filled with water, there would always be a good deal of water with the pigment ; and the addition of egg in equal quantity to the pigment in this wet state is *about* right for most solid painting. Egg-yolk is naturally stringy and thick. It can be made liquid by shaking it rapidly with a much smaller bulk of water. The only recipe I know of for preparing yolk of egg is in the anonymous *Bernensis*, a fragment in Latin, belonging probably to the eleventh century, published with the German Theophilus, but very inaccurately translated. "The yolk of the egg separated from the albumen you put into the dish, having mixed water with it, for on account of its thickness the yolk needs water, that it may become clearer (or more fluid). With a whisk you will whip it like the clarea till it is all broken. Then, however, you will strain it through a cloth." The subject is MS. illumination. As panel-painting with yolk of egg is to be done just like fresco, barring the exceptions, we naturally look back to the chapters on fresco to see what we can learn. In c. 72 we find that Cennino recommends for the secco finishing of buon fresco one of two temperas. The first tempera, as he calls it, is the yolk and white of the egg together, mixed with the juice of young fig-shoots, but exception number two forbids us to use this tempera on panels. "The second tempera is the yolk of egg only ; and you must know that it is of universal application, on walls, on panels, and on iron, and you can not use too much of it, but it

would be wise to take a middle course." We may take this that it could be used more freely and safely on walls than the tempera of the whole egg, which was to be added moderately, "neither too much nor too little, to each of the vases (or small vessels containing pigment) as if you were mixing half wine with half water." That is, I imagine, there was about as much water with the pigment (perhaps more) as you subsequently added egg, and that if you used the yolk only you put about the same quantity of egg to the water, but with better assurance that it would not crack and peel off the wall. The colours for buon fresco were "mixed thoroughly with water"; again "make them flowing and very liquid with water"; "take a little verde-terra very liquid"; "then wash the whole over with the flesh-colours very liquid with water." "Temper them very liquid with clean water" (c. 67). For the secco colours Cennino says: "Prepare these in the same manner (with water I suppose) . . . and temper them all" (c. 72). In one of the tempera chapters (c. 147) he speaks of making a dark flesh-colour very liquid. Pigments mixed with quite undiluted egg are very thick, and not suited for the many layers which Cennino seems to have used. (I do not wish to be thought to say that so many layers *must* be used in tempera.) "And thus, as you have begun, go many times over with these colours, now one and now another, painting and uniting them skilfully, and softening them tenderly." In the directions for painting on primed canvas for church processional banners (there is a roughly painted one at South

Kensington), we find the same painting in many layers. "You must colour on cloth in the method used for panels, that is, in stages (*di passo in passo*), and it is pleasanter than working on panels, because the cloth contains the moisture (*il molle*) a little; and it is exactly like working in fresco, that is, on walls. Also I warn you that when you are colouring, the colours must be put on in many coats, even more than on panels, because cloth has no substance like panels, and the varnish will not show up bright if the paint is thin. Temper the colours similarly as for a panel" (c. 162). This is repeated in c. 165, seven to ten coats of colour being named. We are not without directions to mix water with the yolk in other writings. And, what is more natural, if you wash your brushes out in water, as you must, than to take what you want of the water to make your painting work well ("always washing the former colours from the brush," c. 145). The frequent direction to "squeeze" the charged brush in fresco-painting shows how liquid it must have been.

Although Cennino four times speaks of yolk of egg as the universal tempera (cc. 72, 145, 147), he gives instances of the occasional use of other things. One is in chap. 83, where size and the yolk of egg are used, possibly mixed, to temper azzurro della magna for a mantle of the Virgin. This chapter is about wall-painting. There is an interesting tempering of pure ultramarine in c. 141; "a little glue, and a little yolk of egg, perhaps two drops." This may be done to make the size adhere to the egg underneath.

In treating of the grinding of the colours, Cennino

sometimes adds advice as to their temperas. He says saffron, also green made of orpiment and ultramarine, require size; that green made of orpiment and indigo will bear nothing but size; that verdigris requires size on panels but yolk of egg on parchment and paper;¹ that azzurro della magna takes either yolk of egg or size; that indigo and white mixed to make pale blue take size; that biacca will bear any tempera. I have not myself been successful in using size in the same picture with yolk of egg. If it can be done at all, the size would have to be very weak. It must have been used sometimes, from the following passage saying that the clear size made from the scrapings of parchment "is good for tempering dark blues, and if you should have laid a ground-tint of any colour not properly tempered, give it a coat of this size and it tempers the colours again and fixes them, and you may varnish them if you please" (103).

I am not sure whether I have been right or wrong in taking another hint from the directions to check the absorbency of the wall before the secco work by a diluted wash of egg (cc. 72 and 90), but I generally do begin on primed panels or canvas by a very diluted wash of the yolk having a little yellow ochre in it, and let it dry for a day; and I also dilute the first coat of colour and lay it on very thin. It is advantageous to let this beginning dry well before proceeding. On a gold ground, it is necessary to begin with this first thin coat of colour, and let it dry for at least several

¹ Verdigris is probably not permanent in anything but balsams such as Venice turpentine (see Laurie's Cantor Lectures).

days before proceeding, or the paint will probably crack off the gold. The sizing for banners where the painting is to go, is a mixture of size and white of egg—one white to four glassfuls of size.¹

We next come to the system of painting employed in regard to chiaroscuro. No toning or shading was mixed with the colours. Whether the drapery was to be blue, red, or any other tint, it was painted with carefully prepared gradations (cc. 3-6) of pure colour, ultramarine, lake, or any other, mixed with white only. Of course purple, for instance, or any other mixed pigment would be first prepared and then graduated. These directions are repeated again and again—see especially 71, 72, 145, 147. Were there then no shadows? Most certainly, but they were made by an under-painting of a greenish colour, which was always allowed to show through the thin liquid colouring laid over it. And it is this under-painting, much more skilfully employed by the later tempera painters than by the earlier ones, which gives, I am certain, the extremely illuminated shadow tints and the truthfulness of sculpturesque light and shade which underlie all their rainbow-like colour schemes, and I believe it accounts for the admirable way in which Florentine work especially ‘comes out’ in photography, which

¹ It has been found that in planing away panels to transfer pictures (oil) to canvas the white gesso is not stained by the oil, which implies a coat of size (?) over it (see Eastlake’s “Materials,” vol. i. p. 251).

Cennino seems to be aware of the hurtfulness of oil in direct contact with a gesso ground. “You must know that damp operates on a wall as oil does on a panel: as damp corrupts lime, so oil corrupts gesso and its temperas” (c. 175).

seizes on the pale but correct monochrome on which the picture was built up.

For fresco a shaded monochrome was first painted. The flesh-parts were outlined with sinopia, *i.e.* light red, also the hair, on the rough plaster, and then the thin lime surface-plaster was spread in small portions, only covering as much as could be painted in a day. This was made as smooth as possible by what we should call water-polish. The real drawing in strong outline was then painted on the smooth white lime, with 'verdaccio' made of black, dark ochre, light red and white. Next the shadows were painted with terra-verde. Three tints of flesh-colours were carefully placed over the rest of the flesh, made simply of light red and white. With the darkest tint "go to the edges of the shadows, but always taking care at the contours that the verde-terra should not lose its value, and in this manner keep on, softening one tint into another, until it is all covered, as well as the nature of the work will permit. But mind that if you would have your work appear very brilliant, be careful to keep each tint of colour in its place, except that with skill you soften one delicately into the other" (c. 67).

Similarly, in painting drapery, a shaded under-painting is first to be made. "If you wish to colour any drapery, you will design it first carefully (*gentilmente*) with your verdaccio, and do not let your drawing show too much, but moderately" (c. 71). For painting hair and beards we are told to "make them out always first with verdaccio, and to pick them out with white, and to lay on a flat colour" (c. 69). For

the face of an old man the verdaccio must be darker (c. 68). For buildings we are told: "Put them in first with verdaccio or terra-verde, either in fresco or secco, but let the colour be very liquid."

There is a variation in the method of flesh-painting mentioned, but it was not Agnolo's method, which Cennino preferred for its greater charm and freshness, and which has been already touched upon. In this other method, a flesh-tint was laid all over first, and then the shadows were painted with terra-verde.

In tempera-painting on panels, the two coats of terra-verde were first laid all over as an even bed or ground, the flesh-tints being laid as a light modelling on this. "Then, as you did in painting on walls, you must prepare thin gradations of flesh-colour, one lighter than the other, laying every tint in its right place in the face, taking care not to cover over the whole of the verdaccio, but shading partially on it with the darkest flesh-colour, making it liquid, and softening off the flesh in the tenderest manner. On a panel more coats of colour are required than on a wall, yet not so much but that the green tint under the flesh-colour should just be visible through it" (c. 147). There is no mention of the under-monochrome for drapery in these two or three chapters about colouring, but a carefully shaded drawing on the panel is described as part of the necessary preliminaries for a picture. When the design of the picture has been carefully composed and corrected in charcoal, it is to be outlined with ink (lamp-black) and water. "With some more of the ink and a blunt-pointed minever brush shade some of the

folds and some of the shadows of the face, and you will have made an agreeable design which will cause all men to fall in love with your works" (c. 122). In chapter 145, Cennino speaks of laying the colour on the dark and the light folds as if tinting over an existing light-and-shade drawing. And, as I have shown, the fresco methods were almost exactly adopted in tempera. In later painting there is nearly always more or less shading over the colour, generally a loose warm hatching, and this is often disguised again by very thin glazes and scumbles. And thus very beautiful depth and richness, and atmospheric effects, could be obtained which were unknown to the earlier men.

The completeness of the shaded design made possible the beautiful and enduring thin painting where every stage told in the final effect, and where consequently corrections or *pentimenti* were nearly an impossibility. "When you have finished drawing your figures (especially if the picture be of great value, and you expect to gain honour and glory from it), leave it for a day, return many times to examine it, and improve it where there is need. When it appears to you correctly drawn (and you can copy from or look at things done by other good masters, which is no shame to you if the figure is good), gently rub away the charcoal, &c." (then follow the directions for shading already quoted, c. 122). I have found, in copying, that the luminous half-shadow given by a greenish under-painting, skilfully used, can be obtained in no other way in tempera. Is it not also the secret of the luminous coolness of Correggio's painting?

Evidently Cennino knew, and it is one of the great beauties of the old tempera-painters, that every colour must be kept clear and distinct if brilliancy is to be obtained. As already quoted, every tint was to be laid in its right place on the proper part of the face. In the fresco directions we find: "Take good care, if you wish your work to look very fresh, that your brush should keep to its place in each stage of the flesh-painting except skilfully to unite one (colour) with another" (c. 67). "When you have laid each colour on two or three times, never departing from the scheme of the colours, never letting one colour encroach on or give way to another, except where they meet, then soften (*sfumare*) and unite them well together" (c. 71).

At this early period there was very little hatching, except in the flesh or glazing, or scumbling or intricacy of any sort. The blending and softening (*commettere* and *sfumare*) of the *Trattato* united the edges of the colours, laid at once, though not at one application, in their right places. The enamel-like beauty of surface of tempera, is produced by several semi-solid washes.

The necessity of laying every tint in its right place may be taken as in part indicating the limitations of the vehicle. You cannot move the paint and blend it and work into it like oil-paint; it must be put on and left alone till it is dry. Pacheco (the master of Velasquez, wrote, 1641) says: "Tempera requires decision and to be able to design well with facility, because one cannot lay on and take off easily, for what is done erroneously cannot be mended."

Tempera-Painting 205

The 'knocked together' effects of oil are very nearly approached by semi-transparent paintings of slightly varied tints put over each other wet. And in tempera this is safer than in oil, as there does not seem to be the tendency to become horny and too transparent. The filmy veils which the Florentines loved for their Madonnas are a use of this permissibility of very thin painting.

There is nothing in tempera like oil-brush work. Tempera has more solidity and depth and brilliancy and juiciness than water-colour. It has great force, but not so much depth and illusory quality as oil.

In the directions for drapery - painting, we see the caressing way in which they touched and re-touched and tenderly shaped the simple yet subtle folds in the faintly shadowed garments of the sacred personages. "And for your great pleasure begin to paint (with graduated lake) . . . and thus as you have begun go over and over again with the said colours, now with one and now with another, filling in with them, and uniting them together skilfully, softening them (*sfumare*) with delicacy. And now it is time to stop working, and to rest for a space, and to return to your labour on the panel: which must be worked at with great pleasure" (c. 145). In the fresco chapters there are similar directions for a drapery of graduated cinabrese, the brightest buon-fresco colour, and in secco for an ultramarine drapery, also in three gradations. All of us who love the early religious pictures can call before our mental vision the draperies, like the petals of flowers, which Cennino would teach us

to paint skilfully, garments of unfleshly beings, embodiments of souls; a drapery of blue, a drapery of vermilion, a drapery for an angel of changing green. It was the apotheosis of the hardly-won pigments, made with infinite care from proved and often secret recipes; made too with difficulty and few appliances; their brilliancy not to be lost or wasted by any dusky shading. But the full beauty of colour, either representative or abstract, the great intensity and flame-like glow that we find in the later tempera school, was not yet attained.

Tempera-painting developed far beyond anything imagined at the date of this treatise, and was capable of endless refinements, adapting itself to the ideas to be expressed.

Cennino felt himself unable to explain his painting fully. He says as much: "But by seeing others work you will understand better than by reading" (c. 71). "But seeing others work and practising with your hand will make you understand better than seeing it written" (c. 67). There is not now much opportunity of seeing others work, but there is still the resource of practising with the hand, and if this is undertaken on a definite plan some good result may be arrived at. The permanence of the early work did not only depend on the materials used, but on how they were used, and for tempera at any rate the materials are as good as they ever were.

I have pointed out that Cennino, in his complete familiarity with his yolk-of-egg tempera, forgets to say whether it was used diluted, or mixed with anything

else or not. He also omits to say whether it ought only to be used fresh, or might or ought to be used stale. It seems to be very commonly thought that really rotten eggs ought to be used, and one of the later MSS., the *Marciana* (first half sixteenth century), dubs yolk-of-egg tempera with the not very pleasant title of painting *a putrido*, no doubt a nickname gained by unavoidable accidents. Great care was taken by miniaturists to prevent decomposition by putting red orpiment, camphor, and later, vinegar, in their white of egg. In this MS. the addition of water is mentioned. "The tempera of these colours prepared *a putrido* is water and the yolk of egg." For Pacheco egg-tempera meant the whole egg with fig-milk. His colours were to have the egg poured off them at the end of the day and clean water put on instead, "for egg generally goes bad and gets hard when it is left for some time."

The preparation of the white of egg for painting may be of interest to some people. It was the usual vehicle for MS. painting. It is quaintly described in the anonymous *Bernensis*.

"Know then that there are two sorts of clarea, one made by whipping and the other by breaking. That made by breaking is more fragile or weaker than that made by whipping, and is less clean than it, because being often broken (poured) or passed through wool or canvas, it takes dirt from the hand of the person pressing it through. . . . He who wishes to know this by experiment, let him use one and the other kind . . . and let him see how limpid is the one and how turbid the other. . . . For colour and clarea must always be

treated in the most clean manner, as they can only be made beautiful if prepared delicately and diligently . . . if the clarea is not well beaten, how can the colour be well-tempered with it ? . . . When now you will prepare the clarea you will separate the albumen from the yolk of egg, and having put the albumen in a dish, strongly and without cessation you will whip this white of egg with the above-named rod (a small iron loop with a straight handle) until it is as if changed into water or into likeness of snow, and adheres to the dish and loses the power of running or of turning aside at all, even if you turn the lower part to the top, so that the bottom of the dish is at the top, and the clarea below. But this should be known: if you strike this clarea, whipping it seven or ten times after it sticks to the dish . . . it will be bettered. This same bad beating of the white misleads many, and it becomes when it is less whipped almost glue, and poured into the colour it makes their colour string like a thread, and that colour will be entirely ruined. . . . When the clarea is whipped, put the dish a little inclined in a quiet clean place, that the liquor of the clarea may run down from the froth. If it is the heat of the dog-days, put it in a cold place that it may not dry, but if it is the cold of winter, put it in a warm place that it may not freeze. The liquor of the clarea having run out, and the shell of the egg being cleaned, pour this liquor into this shell. Should it remain long in the dish it will be deteriorated, but most in summer. . . . But in the nature-given vase it remains in a natural condition."

A mixture of clarea and gum was used for MSS.

In the Strasburg MS. we find this way of making it: "Take the clear of three eggs in a clean dish, and beat it with a spoon till it becomes thin, and take a strong linen cloth and press the clear through five times till it no longer froths. Afterwards take $\frac{1}{4}$ oz. (*ein settit*) of gum-arabic and lay it in the egg-clear and let it melt; after that take a full spoonful of vinegar and work it into the egg, and then put into the clear as much sal-ammoniac as one white of egg, and set this water aside till it is wanted."

I have been experimenting myself in the attempt to see how far unaided tempera can be made to go in reproducing fine cinque-cento effects, but it is much to be wished that the under-painting of oil with tempera should be thoroughly tried; or, to put it rather differently, that the technique could be revived by competent painters of painting the solid dead-colouring of pictures with egg or size colours, glazing over this with transparent or semi-transparent pigments in varnish. Modern investigation and examination prove more and more that this was how most pictures were painted of most schools in the early and palmy days of so-called oil-painting. I have seen several very successful trials of this method over a thin and also heavily impasted under-painting.

CHEMICAL BEHAVIOUR OF EGG-VEHICLES

YOLK of egg does not fulfil all the requirements of a tempera or vehicle for colours, for it does not perfectly protect the pigments from the action of the atmosphere. It appears, however, not to injure them by discoloration or otherwise, and certain beauties can be given in this method which seem impossible with oil. The protection also, though not perfect, is not inconsiderable, and many oil-pictures that are painted nowadays will have rotted to their graves while the best fifteenth-century tempera pictures still keep the bloom of youth. Their rivals in durability, fifteenth-century Flemish and German 'varnish' pictures, were probably many of them painted over a dead colouring of size or egg-colours, with a varnish tough, pale, brilliant, and protective beyond any known now.

What little chemistry has to say about egg-vehicles is soon told. The following analysis is taken from Professor Church's "Chemistry of Paints and Painting." He told me verbally that he thought egg-tempera the most permanent kind of painting there is.

	<i>Yolk. White.</i>			<i>Yolk. White.</i>	
Water . . .	51.5	84.8	Fat or oil . . .	30.0	0.5
Albumen, &c.			Mineral matter	1.4	1.2
(<i>vitellin</i>) . .	15.0	12.0	Other substances	2.1	1.5

The albumen in which the egg-oil is suspended as an emulsion dries with it and in time they become insoluble, as also the albumen alone, which will be found, on trying to wash a palette on which the colours have been left for some months, or a brush, if not rinsed immediately, which has been used for applying the white of egg and bole preparation for gilding on. White of egg alone dries too hard for painting with, and has very little body, and in time has more tendency to crack. The coagulation may be accelerated by exposure to sunshine, and probably by gentle fire-heat.

Although neither vinegar nor fig-sap seem, generally speaking, to have been mixed with yolk of egg, I have found practically that a few drops of acetic acid, the pure principle of vinegar, make an advantageous addition. I put about twelve or fifteen drops of three-per-cent. acid to one yolk, and gently and thoroughly shake them together without making bubbles. This is pleasanter to paint with, the egg keeps good for weeks, and it dries harder. Professor Church recommends that the "alkaline reaction (of egg-yolk) should be exactly neutralised by the cautious addition of a very few drops of white vinegar," or else "a saturated solution of eugenol (from oil of cloves) in five-per-cent. acetic acid is first made, and added drop by drop to the yolks, with constant agitation, tested by turmeric paper, which, reddened by the yolks, regains its yellow colour when there is enough acid. After this, any necessary water may be added and a lump of camphor.

In his "Pigments and Vehicles of the Old Masters," Dr. A. P. Laurie notices that the juice of the fig-tree (p. 25) was added to the whites of eggs, and that "the fig-tree belongs to the same family as the india-rubber tree, and its juice contains caoutchouc. We are thus brought to recognise the interesting fact that caoutchouc was used as a medium for painting long before its properties were known. Doubtless the mixture of caoutchouc and albumen would make a very tough and protective medium." Fig-milk has the solvent properties of vinegar in mixture with egg, as Pliny knew, which is the reason commonly given for using it. I have not tried it, but Ernst Berger of Munich,¹ who has experimented recently in various vehicles, says that the whole egg mixed with the milk exuding from the cut-up twigs is pleasant to paint with, keeps good, and when dry this tempera is more water-resisting than the egg alone.

Egg that has gone bad does not dry well, and the sulphur which is liberated by decomposition is likely to be mischievous. Some aureolin painted with bad egg turned burnt-sienna colour. This change must undoubtedly have been caused by a red compound of sulphur having been formed with the cobalt base of the aureolin. It is safest to exclude lead and copper pigments from the tempera palette, which might be injured by the sulphuretted hydrogen and ammonium sulphide produced in the process of 'going bad.'

Egg-oil is suggested by Vibert² as being probably

¹ *Beiträge*, Part III. pp. 98 and 105.

² Science of Painting.

a superior vehicle to the natural egg-yolk. Egg-oil was very well known in mediæval times, and most of the possibilities of eggs, for they were given a sort of mystic exaltation by old alchemists on account of the life-germ they contain. It is made by boiling the yolks hard, and expressing the oil, which of course is not hardened by heat, but only the albumen.¹ It never seems to have been used for painting, and it is probable that the albumen adds to the drying properties of the vehicle.

Though egg-yolk may be an oil-medium of a kind, it is doubtful whether it can be associated with other oils,² and grease of every kind must be kept at arm's length. Because amber can be dissolved in egg-oil, we must not conclude that we can mix amber varnish with yolk of egg. Powder colours ground in turpentine should be avoided.

These remarks have nothing to do with the use of tempera as a substratum for oil or varnish painting, for which it is well suited. Oil lies on it very well there, though tempera peels from a ground containing oil, unless the oil-paint is prepared as by being rubbed with garlic; but the advisability of such treatment is open to question. Any one painting in tempera escapes the risk of badly prepared oil, of injury caused by abuse of turpentine or other diluents, of

¹ *Liber Sacerdotum*, tenth century.

² Berger considers that egg-yolk and drying oils can be used mixed, and oil thus compounded can be made to blend with water. Vasari says that Alesso Baldovinetti mixed yolk of egg with liquid varnish to finish fresco, but that it peeled off.

adulteration and spoiling in the tubes. The separateness of the final varnish is another point worth consideration. The paints go a long way, so it is a cheap method. It is not generally known that aluminous earths are commonly ground with many of the pigments for oil-painting to make them 'set up,' and that the practice is not unknown of adding non-drying substances to prevent the paint hardening in the tubes. Size was sometimes used in the same picture as egg-tempera, but there seems no sufficient reason for doing so. It must have needed a very conscientious conscience to turn from the tractable egg to the tiresome size, which must be kept warm, and dries directly in the brush. Rules for using size are: the ground should have no grease in it; the mixed colour should run or drop from the brush in a thread; all coats except the last should be applied warm: but boiling spoils the tenacity of the size; size must always be well made and fresh. Stale size does not dry properly. It was, however, sometimes used stale in gilding on parchment.

FRESCO AND ITS RESEMBLANCE TO TEMPERA

THIS is the earliest complete description of true fresco as practised in the Renaissance period, that is, by laying on each day so much of the final coat of lime intonaco as could be painted in that day. Quicklime is calcium oxide, when slaked with water it becomes calcium hydrate. In this form it is made into mortar, and then slowly takes up carbonic acid gas from the air, and becomes calcium carbonate, crystallising in the process. The incorporation of the colours with this crystallising process binds them to the wall. But the hard skin forms quickly, and it has never been thoroughly explained how such large surfaces as are found at Pompeii without joins could have been painted in fresco alone.

The Romans used many coats of plaster—Vitruvius says seven, Pliny five—instead of the two we now think sufficient, and which seem generally to have been considered enough in the great period of fresco. These were all made with lime, but in the lower layers crushed bricks and tiles were used, in the upper one marble dust in graduated fineness. Then all the coats were beaten together and smoothed. To secure that plaster should be free from cracks, it is necessary that

the lime should be very thoroughly slaked and well worked, that is, kept in water for about two months, after which, if kept in jars from which the air is excluded, it still improves.

The fresco-painting for which there are directions in the *Hermeneia*, and which Didron actually saw done at Mount Athos, seems to have been painted in larger areas than Cennino contemplated, kept moist by a very thick plaster-bed. The wall was first to be thoroughly wetted. "If it is a brick wall, you must wet it five or six times, and you must put on a coat of lime two fingers or more thick, to retain the moisture fit for use. If it is a stone wall, wet it only once or twice, and lay on a much smaller quantity of lime, for stone takes and retains moisture better. In the winter, put on one coat in the evening and the superficial one the next morning. In the summer, do what is most convenient, and after having put on the last coat, level it till it becomes firm and then work."

Here, if Didron reports correctly, the mortar is all lime, only mixed with straw for the under coat, and with tow for the upper. Didron saw the whole process, and says, what is rather incomprehensible, that three days were allowed to elapse after the plastering was finished before the painting was begun, to allow some of the moisture to dry out. "If the painting were done sooner, the lime would injure the colours; and after a longer delay the painting would not be solid, would not unite with the mortar, which would be too hard, too dry to absorb the colours." The painting which he saw done took about ten days to do. Didron

Fresco and Tempera 217

mentions no binding material for the azures, &c., which were only painted when the wall had dried thoroughly. In the *Hermeneia* we find bran-water used for blue, no other vehicle is mentioned in connection with fresco. Pliny speaks of saffron being applied to the walls of a temple at Elis with milk. Milk, especially that of goats, was preferred to egg for retouching by the later painters, notably by the Spanish school, but in theory retouching with anything was looked on as mischievous, dulling the brightness in time; but in the *Trattato* the finishing in secco is treated as indispensable, or at least as inevitable. Unless Theophilus describes incorrectly what he only half understood, fresco was then either degenerate or half developed, for his process is only painting with colours mixed with lime on wetted plaster. The Mount Athos fresco would then be a further stage, and Cennino's a still further but not final one. But the technique was hardly perfect before the art declined.

A very small attempt in fresco made me wish I could substitute it for tempera. But sulphuretted hydrogen is a remorseless enemy to any revival of true fresco.

Both in past and present times there have been writers who have judged fresco and tempera as being essentially one thing. Perhaps tempera may be said to occupy a half-way position between fresco, the only painting Michael Angelo thought worthy of men, and oil-painting, which, according to him, is an art fit only for women and for idle and incapable men. He did not disdain tempera himself, as may be seen in

our National Gallery. Armenino of Ravenna (1586, ii. p. 105) twice speaks of tempera-painting on panels and cloths as painting in secco, and when he speaks of the vehicle to be used for retouching fresco with dark transparent tints he says the best for this, and therefore the best for retouching secco on panels and cloth, is tempera, *i.e.* yolk of egg.

Breadth, transparency and purity of colour, and decision of painting are the qualities on account of which tempera might plead to be no longer a lost and forgotten art, sheltering itself under a corner of the mantle of great Fresco without arrogance.

This breadth and transparency are owing to the gradual bringing forward of the picture from a simple outline of extreme beauty, as will be seen by any one who should take the trouble to make a completed outline of any fine early picture; and this outline is never lost; its beautifully opposed and harmonising lines and masses are retained to the end, even strengthened and accentuated, giving great distinctness at a distance even when not actually visible. A perfectly modulated monochrome of light and shade fills the outline, apparent through the overlaid glory

colour, over which again is thrown a veil of atmosphere, a refulgence of light, a suggestion of palpitating space. The colour design might be repeated in glass, being so decorative and balanced, but photography reveals the truth of the lighting and relief which it is based upon.

These final stages of tempera are difficult, but not more difficult than producing the texture of subtly

Fresco and Tempera 219

finished oil-painting, such as Titian's. Fresco has by nature a softer, more mellow surface. The hatching, with which so much fault is found in tempera, belongs principally to the finishing stages, and it is difficult to dispense with it altogether, as a brilliancy can be given by this method of intermingling touches of pure colour, which is different from mixed tints and often very valuable. The beauties of tempera are not those of preciseness of values and gradations, nor of dexterous brush-work. The charm is more in its simplicity and unconsciousness and carelessness of effect, with complete absorption in the subject, which the picture is the means of realising to the spectator. Hatching is often the quickest and best way of producing luminous and well-graduated shadow. Large-size photographs of the ceiling frescos of the Sistine show that the figures are modelled with loose, easy line-work, quite startling in the power and knowledge of form it reveals. The cool gleam of the flesh-colouring of this ceiling is very wonderful. Hatching and stippling are not at all uncommon in oil-painting. Armenino, after describing at length the difficulties of naked flesh in fresco and admiring the rapid handling of some painters, says: "But the muscles of naked figures, as being of greater difficulty, are painted by hatching them in different directions with very liquid shade tints, so that they appear of a texture like granite; and there are very brilliant examples of this painted by the hand of Michael Angelo, of Daniello, and of Francesco Salviati, who are very celebrated for their works."

EARLY OIL-PAINTING

OIL is mentioned for purposes connected with the arts as far back as the Augustan age. Ludius, an encaustic painter living then, mixed in some oil at the burning in of the wax-colours. Vitruvius (same period), to prevent vermilion darkening in out-of-door work, directs that the wall when coloured and dry should be coated with Punic wax melted on the fire and tempered with a little oil, laid on with a brush, and driven in by the heat of a portable stove. Cornelius Celsus (Tiberius) mentions red lead as a drier for oil, but for medicinal, not artistic purposes. Pliny describes the method of protecting vermilion in nearly the same terms as Vitruvius, probably borrowed from him. He mentions a number of oils, among them linseed-oil and nut-oil, but he does not speak of them as useful to painters, as in the case of gum and size. He also says that every resin can be dissolved in oil. Wax at that time, as a protection to walls and statues, and forming also a paint with a great deal of body in it, had functions both decorative and pictorial similar to those of our oils and varnishes.

Lucanus (Nero) recommends painting with natural balsam as the best way of uniting the power and harmony of the oil with that of the colours. Dioscorides

(*temp.* Anthony and Cleopatra, or rather later) was acquainted with many kinds of oil, and describes a method of bleaching it in an earthen vessel in the sun, beating it till it froths, when it is to be mixed with resins, and if necessary put again in the sun.¹ Galen (131-230 A.D.) knew methods of rendering nut, hemp, and linseed oils drying (vii. 12). Litharge was known in the first century A.D., and in the fourth it is mentioned in conjunction with oil by the medical writer Marcellus. In the fifth century we find oil thickened in the sun was used to protect gilding. In 540 Aetius, a physician from Amida in Mesopotamia, wrote of drying-oils which were also prized in the arts, Ricinus-oil and linseed-oil; also nut-oil, obtained like almond-oil, useful to "gilders and encaustic painters, for it dries and preserves gildings and encaustic paintings for a long time."

In the Lucca MS., founded on the classical tradition but compiled in Italy towards the end of the eighth century, we find various more or less elaborate compositions of linseed-oil with resins for protecting painting and gilding, and for imitating gold by colouring tin yellow by means of a staining colour added to the varnish.

It seems probable that the discovery was gradually made that the oil, which was at first mixed with wax, could be mixed with pigments without the intervention of wax, but the first definite account of this is in the *Schedula* of Theophilus, who must have lived at the end of the eleventh or the beginning of the twelfth

¹ Dios., I. 32.

century, and was almost certainly a German. He seems to have known of no method of purifying the oil he used, which was linseed (he was also acquainted with olive, walnut, and poppy oil), or of making it drying, and it therefore seemed to him a very tedious (though a possible) method for "tints for faces and for draperies . . . beasts, or birds, or leaves in their various colours," especially for figures, because each time a colour was laid on the work must be dried in the sun, before another could be superposed" (chaps. xx., xxvii., xxviii.). Oil is frequently mentioned in two documents which seem to be in part derived from the same sources as the *Schedula*, namely, the book of St. Andemar, and the third book of Eraclius: these two seemingly written in France, twelfth or thirteenth century. The practice indicated seems to correspond with the records of the work carried on by our kings at Westminster and elsewhere, and in our cathedrals, from the middle of the thirteenth century till about the close of the fifteenth, not much of importance being done till after Henry the Third's marriage with Eleanor of Provence in 1236, which may very likely have inaugurated an artistic period in England founded on the French schools.¹

Eraclius (III. xxix.) gives directions for preparing oil for tempering colours by adding a moderate quantity of lime, heating and skimming it. White lead being then put in as a drier, the oil should be placed in the sun for a month or more, and frequently stirred. This is the only old MS. where white lead

¹ See *Monumenta Vetusta* V. of the Society of Antiquaries, and J. T. Smith's "Westminster Antiquities."

grounds are mentioned, being here directed for both wood and stone (xxiv., xxv.).

Oil is frequently mentioned as a vehicle for colours, especially by St. Andemar. There is no evidence, however, that this oil-paint was for pictures. If anything, in these two MSS. the evidence is rather that it was for decorative purposes. But this is a subtle modern distinction often leading to erroneous conclusions. The Sloane MS. (1754 B.M.), another French MS. in handwriting of the end of the thirteenth century, frequently mentions oil as a tempera in a similar way to the two preceding.

The very early 'Byzantine' paintings in the Cologne Gallery are coarse in execution and appear to be oil-paint. In England, the Painted Chamber mural pictures, begun about 1250, must have been in tempera or fresco, judging from what is said of them then by those who examined them after their discovery in 1819 and before their destruction in the burning of the old Houses of Parliament in 1834. The dignified figure of St. Faith in Westminster Abbey, however, does not appear to be tempera, nor the decorative borders. The paintings in the Chapter-House under the sedilia opposite the door are no doubt oil-painting. The really fine remains saved from the destruction of St. Stephen's Chapel, painted in the middle of the fourteenth century (in the mediæval room, British Museum) are an unsolved riddle. Great quantities of varnish and oil were used in painting the chapel, an oil-and-lead ground was used, and the analysis of some of the pigments seems to have showed admixture

of resins; also there is a solidity in the handling, which is most like oil-painting. But the colours have the fresh bloom and whiteness of tempera, and this too shut up in a dark case in the Museum, where oil and white lead should discolour. A noticeable point, too, is that the very slight cracking of the blue parts is different from the rest, which is deeply cracked, and ultramarine blue was often painted with tempera to quite a late period where the rest of the picture was oil. The portrait of King Richard II. painted about 1394, which is within the altar-rails in Westminster Abbey, was considered by Richmond, who superintended its cleaning, to be tempera, but it has the extremely raised darks which are usually distinctive of oil-painting. Very likely both methods are used in it. In the South Kensington Museum, on the staircase leading to the water-colour collection, there is an early crucifix with a painted Christ from an English church showing the darkening of oil-paint, but there is nothing to fix the date with certainty.

An exhibition of as many movable pictures of early date as could be brought together was held in the rooms of the Society of Antiquaries in June 1896. There were several of apparently late fourteenth-century work, in oils. A panel from the Cathedral of Norwich in five divisions (14), and two from the church of St. Michael at Plea, Norwich (15), were respectively tempera and oil, but in other points resembled each other closely. The date of both is fixed by the cap-like helmets of the soldiers, which were not in use after the end of the fourteenth century. Some

boldness is necessary to say that a picture painted before 1400 is in oil or oil-varnish, anticipating Van Eyck's discovery, but the panels from St. Michael's at Plea are certainly one or the other. Otherwise they seem painted with the same palette, and the type and treatment of the faces is very similar, especially the hair, beards, and mouths.

When such a picture, really in wonderful preservation after 500 years of careless treatment, is spoken of as 'in oils,' oil-varnish would probably be the more correct expression; and in the Strasburg MS., written at the beginning of the fifteenth century, deriving some of its material from a master of Lubeck, a Hanse town, and some from a master of Kolmar, we find the first known directions for mixing varnish with the colours, a few drops being added to each. The writer does not speak of this as any innovation, though he says that his method of preparing oil is not known to all painters. His varnishes also seem to be neither secrets nor novelties. The oil, either nut, linseed, or hemp-seed, is boiled up with pumice-stone and calcined bone, and skimmed. Then one ounce of white copperas is added to a quart of oil, which is put four days in the sun, and should then be quick-drying, and clear and bright as crystal. No similar chemical preparation of the oil was known in Italy till much later. The Strasburg MS. was most likely written in about the middle of the lives of Van Eyck and Cennino, who were contemporaries. Van Eyck's secret must be sought in the preparation and materials of his varnish, and the method by which he conquered the viscousness of varnish so as to be able to paint in such small touches

of such extreme sharpness without impairing its brilliancy and durability. This quality of great limpidity is, however, observable in the Norwich picture mentioned above. It is remarkable that the directions for flesh-colouring in the Strasburg MS. are extremely barbarous, as if dating from a much earlier period, but they are associated with the drying oil and the directions for the inmixture of varnish with the colours, and oil is distinctly mentioned as the vehicle in this crude figure-painting.

In various places records have been discovered of the use of oil in the accounts of decorations of buildings in the fourteenth century. In England, at Ely in the fourteenth century, at Canterbury in the thirteenth, at Westminster in the thirteenth and fourteenth, large quantities of oil were used. In 1356 the Duke of Normandy ordered the decoration of his castle with sacred and profane histories, "et toutes ces choses dessus devisées seront fêtes de fine couleurs à huile." In 1314 there was oil-painting in Chambery by Giorgio d'Aquila; in 1341 "pointure de bonnes couleurs a ole" was used for a tomb in Tournay; in 1351-1352 there are records in the archives of Bruges of painting in oil done in the chapel of the town-hall at Damme.¹ These notices could be extended. Before flesh and faces were attempted in oil it was sometimes used for draperies, exactly as we find in the *Trattato* (cc. 143, 144), where no allusion is made to German practice (c. 89). There are, however, scarcely any reliable notices of oil having been used at this early time in Italy. Crowe and

¹ Ilg's *Excurs über die del malerei*.

Early Oil-Painting 227

Cavalcaselle ("Early Flemish Painters") speak of panels by Broederlain in the museum at Dijon, and of some other panels in the church of St. Sauveur at Bruges, where the flesh parts are tempera and pale, and the draperies are in oil and richer in colour. This practice is part of the general notion that each pigment had to be humoured with its own tempera. Later, we find size used for azures when the rest of the picture was in oil.

How little was known in Italy of the northern methods, and how well and long the 'secret' was kept may be seen from the following quotation from Filarete, writing about 1465, evidently with no more knowledge of the technique and the preparation of the material than Cennino had. After speaking of fresco and tempera, which he considers similar, he tells the little he knows about oil. "But this last is another practice and another manner, which is beautiful if you know how to do it. In Germany there is good work done in this way, especially by that master Giovanni of Bruggia, and master Ruggieri, who have used excellently these colours in oil. Well, tell me how is painting done with this oil, and what oil is it? The oil is linseed oil. Is not that very dark-coloured? Yes, but that is taken from it; I do not know in what way, unless it is this: put it in a vessel and let it stay there a good time, and it clears itself. It is true that he says, that there is a way of doing it quicker."¹

Oil is now thoroughly washed by repeatedly beating it up with water, as a preliminary to everything else. This separates mucilage and other impurities, and by this process alone the oil becomes very siccative.

¹ See Filarete, in *Quellenschriften*.

GROUND S AND SIZE

So much might be said about grounds and panels, that what I have space to say can only be a few fragments. For panels many different woods have been used. Pliny mentions larix wood or pitchpine (L. 16, c. 73). The Hawara portraits (N.G., second to third century, Græco-Roman) are said by their discoverer, Professor Flinders Petrie, to be sometimes on pine-wood, but generally on cedar. According to Cennino, panels should be made of poplar (the wood generally used in Italy), lime, or willow. In the Life of Giovanni Bellini, Vasari speaks of the Venetian custom of painting on canvas as opposed to the usual maple or poplar panel. If they used wood, it was that from German firs. Raphael is said to have generally painted on chestnut panels, which closely resembles oak. They are usually extremely thick, the Transfiguration being, for instance, on five planks three to four inches thick. Flemish, Dutch, and early English pictures are generally on oak. Van Eyck's Arnolfini (N.G.) is on oak, protected at the back by a composition of black paint and tow. Nothing better can be desired than old seasoned mahogany which has been used for table-tops and counters, from being obtainable in such large pieces, and being freer from resin

and less likely to crack than most wood. The less a piece of seasoned wood is re-worked the better, as this often starts afresh the tendency to warp or contract. Cennino's plan of boiling the panel is analogous to the modern process of soaking in hot water and steaming.¹ Larger panels should be stiffened at the back by gluing on battens of similar wood with their fibres in the direction of the fibres of the panels. These battens have, on the side next the panel, square-shaped notches at regular intervals, forming rows across it. A cross batten is passed through each row of holes formed by the notches. These cross battens are kept steady by an unnotched batten being glued across their ends. Sufficient play is allowed in this way for contraction, and expansion and warping is counteracted without the risk of splitting.

The Egyptians sometimes dispensed with a wood foundation altogether. A cover for a coffin is described by Berger,² consisting entirely of about twenty layers of sized linen, the upper layer having gypsum spread over it, and over this again another layer of plastered linen, with figures and ornaments cut out in it, so that a very low relief is obtained. An ingenious way of binding the ground to the wood in another sarcophagus is noticed by Dr. A. P. Laurie,³ the wood having been rubbed and torn up with sand mixed

¹ "Chemistry of Paints and Painting," Church, pp. 23-25.

² *Beiträge*, Pt. II. p. 8.

³ Cantor Lectures, published by the Society for the Encouragement of Arts, Manufactures, and Commerce. John Street, Adelphi.

with gum-water. On this curious layer of concrete the fine white gesso had been laid.

Linen and leather—or parchment—have both sometimes been used over wood from a very early period, to guard against mischief from shrinkage. A remarkable instance of the use of both is given by the German chemist John.¹ “The magnificent sarcophagi in the Minutoli collection, for example, are first covered with linen by means of glue. On this follows a thin coating of ground chalk, with size, which is again covered with a painting of size in which is a woven mesh of parchment threads, and lastly with a second priming of lime” (he corrects this to chalk). On this the hieroglyphics were painted with size. A late Roman writer—Boethius (470–526), in his *De Arithmetica*, Preface—comparing the arts, says: “Panels to be painted afford a complex material; entrusted to the care of carpenters; the waxes collected by the care of country-folk; the pigments for the colours sought out by the skill of merchants; the linen wrought by weavers.” Pliny speaks of canvas for large coarse paintings, as for the portrait of Nero, 126 feet high, but not of covering panels with it.

Theophilus covered his panels with the untanned skins of the horse or ass, glued on with cheese glue, and primed very thinly with burnt gypsum or chalk and size made from skins (L. i. 18, 19). Mrs. Merri-field in her preface mentions a ‘Greek’ Crucifixion in the Campo Santo at Pisa on parchment stretched on a plank. According to Eastlake this was common: “the

¹ *Reise zum Tempel des Jupiter Ammon* (Minutoli).

darkly varnished Byzantine pictures are frequently painted on leather glued to the wood" (p. 59). The only instance I have seen of skin used between the panel and the priming is in the Retable of the south ambulatory of Westminster choir, strips of parchment having been laid over the joins of the wood; but the practice does not commend itself. Judging from this example. When I saw it these strips were separating from the wood and curling up, tearing the plaster priming to bits, and evidently the principal cause of the ruinous condition of the painting. It is now being relaid on the ground.

The early pictures in the Academia at Siena showing Byzantine influence are all underlaid with linen, which also passes over the mouldings forming the frames, but there is nothing to show they are better preserved on this account—rather the reverse. Rossini (vol. i. p. 122) says that Giunta's pictures were executed on linen cloth stretched on a panel (glued to the panel would probably be more correct). I have been told by Professor Church that he had had occasion to examine a great many old panels, and that he had always found linen between the wood and the plaster ground, usually at right angles to the fibres of the wood as if to bind them together, but in one case diagonally. There are some slight diagonal ridges in our Van Eyck's Arnolfini (N.G.), from the top left-hand corner through the man's purple cloak and background near it—which, I think, may be the edges of strips of linen.

Either for gilding or for painting grounds, plaster of Paris was widely in use. Professor Church said

he had always found some in every ground he had analysed. Theophrastus describes the process of making it, its rapid setting when wetted, and its durability as a stucco, often outlasting the walls it was laid on. According to Pliny other softer white earths, chalks, and pipeclays were generally used as grounds to paint on. His gilding ground, leucophoron, is described above (p. xxi). Plaster of Paris has not, I believe, been found at Pompeii, but the three 'Greek' manuals, the *Schedula*, *Hermeneia*, and *Trattato* all direct the use of burnt gypsum, either slaked or raw, for gilding grounds and pictures. In the Lucca MS. they are burnt gypsum and bull glue. Theophilus gives chalk as an alternative. Chalk may have been most used in northern countries. Alcherius (French) speaks of it,¹ and the *Liber Illuministarius* (German).²

In the Bologna MS., early fifteenth-century Italian, the priming directions are nearly the same as Cennino's: three or four coats of hot size, which must dry tolerably, the last thoroughly; then plaster of Paris mixed with warm water laid on as a paste, and scraped fairly smooth when dry; then ten coats of slaked plaster, with weakish size laid on with a brush. I confess I do not understand the gesso grosso without size; it would be very friable; nor the advisability of the two sorts of gesso; nor how a panel could bear so thick a wet coating without warping irremediably. It is usually considered necessary that each layer of gesso should be applied while the previous one is damp,

¹ "Ancient Practice of Painting," vol. i.

² *Beiträge*, Pt. III. p. 179.

or else be rendered non-absorbent, for it is found that gesso does not adhere well to a dry, absorbent ground, yet here and in the *Trattato* the gesso grosso is allowed to dry before the gesso sottile is applied.

Plaster of Paris, which is burnt gypsum, and whitening, which is powdered chalk, are the two materials now and formerly almost exclusively used for grounds. The Italian name for burnt or baked gypsum is gesso grosso; when it is slaked it is gesso sottile. Slaking is wetting the gesso grosso with so much water that it is unable to set. It recrystallises into needle-shaped filaments, which in a way felting together, help to give it the pliancy and toughness which it possesses in a marked degree, and which gesso grosso and whitening are quite deficient in, they being composed of amorphous particles like sand, in no way cohesive. It seems to me a mistake to grind gesso sottile, as nothing should be done to disturb its crystalline conformation. Gesso grosso is not coarse, as its name seems to imply. The best is sifted through silk sieves, and feels like satin between the fingers.¹

The *Hermeneia* gives the preparation of gypsum, which there is twice burnt and twice slaked, and only the slaked is used; but, as a rule, it must have been bought ready-burnt.

Almost invariably size was mixed with the gesso grosso, with the gesso sottile always. For the first the size should only set into a very weak jelly. For the second it should be a little stronger. In Pliny's

¹ For information as to the composition, preparation, and qualities of plaster of Paris see Millar's "Plastering."

time it was bull glue, also in the Lucca MS. and the *Hermeneia*; and St. Andemar describes a glue from oxhide as a mordant for powdered tin. Theophilus used horse and ass skins, the skins of eels, and the bones of the head of the wolf-fish, and a bladder and cuttings of thick vellum are to be used to make glues for 'a picture of gold.' The bladder was probably that of the sturgeon. But the size most frequently recommended for all purposes is that made by boiling down parchment cuttings, and this is the size used by modern gilders. Sometimes skins or white leather were used. Alcherius says cuttings of white leather make the glue stronger. In a late document, size from pig skins is said to be more pliant.

Except in English, there are not distinct words for size and glue, and the word glue is constantly used in translating, where size would be more correct. The things are distinct. Size is gelatine principally obtained by careful boiling from skins or bones (fish or animal). Too long boiling or too high a temperature partly changes it to a non-gelatinising substance. Glue is chondrine, obtained from cartilage, and is a less tenacious substance than size.

The best size for painters is made by boiling parchment shavings with enough water to cover them, for about one and a half to two hours, as long as the water looks clear. When cool it should be a stiff jelly. A thin layer dried on a plate in the wind becomes pliant like horn and almost impossible to break. Gilders boil the parchment at simmering heat for a much longer time, and make 8 lbs. of size from 1 lb. of

parchment. After it is once made it must not be boiled again, and the fresher it is used the better. Both Cennino and the author of the *Hermeneia* evidently used it freshly made, even before it had once cooled. Decomposing size is useless, except that it seems to have been occasionally used as a mordant for gold.

I should like to explain priming with gesso in detail, but have not space. Gradually throw the gesso grosso into a basin of warm size standing in a warm-water bath, and stir it smooth with a spoon—metal or wooden—till it is a perfectly smooth thickish cream. Apply it on the sized panel with a worn varnishing brush of bristles; at first very thinly, well worked in; when this coat is set but still moist, rather more freely, each coat in a contrary direction; three or four coats are enough—all one mixing. The back should be primed too, to prevent warping. When dry enough, the panel may finish drying under pressure. The smooth face is now generally given by rubbing with a flat pumice-stone and water, finally polishing with fine glass-paper and linen rags.

Gesso sottile needs stronger size, as has been said above. Soak the cakes of gesso in water, then mash them up in the size. Work the mixture through strong muslin. It is a thinner and more transparent cream than the other, but becomes opaque in drying. It is an admirable ground for gilding on; better than the gilder's whiting in common use, and is the only gesso which can be used on canvas in sufficient quantity to make a smooth surface, two very thin coats being enough, only polished with glass-paper.

Professor Church recommends that the size for priming should be made of half parchment glue and fish glue, but the latter has not borne a very good character. Vandyck tried it, according to De Mayerne in a note dated London, May 28, 1633: "The ground or priming for pictures is of great consequence. Sir Antonio Vandyck has made the experiment of priming with isinglass (fish size) but he told me that what is painted upon it cracks, and that this glue causes the colours to fade in a very few days. Thus it is good for nothing." Valentine Boltz says that fish glue is not so strong as other glue. In the *Hermencia*, oil is introduced into gilding grounds, and honey into the gesso grounds for tempera on canvas. Both these are exceptions to the general rule. Honey and sugar are constantly ingredients in the gesso used under gold in MS. but not otherwise.

Alcherius gives a Flemish recipe for a priming for gold on linen, which may be folded. He relies simply on the flexible quality of good size, preferable for this to egg, but adds nothing else.

Gesso grounds for oil-painting continued in use for a long time, the dead colouring being frequently painted in tempera or distemper, but there are not many tempera pictures on canvas, that is, painted throughout in tempera. The Nativity, by Botticelli, shows the grain of a fine twilled linen all over the surface, especially in the gold background to the angels in the upper part, and is marvellously fresh, but it may be gilded all over, which would greatly

assist to preserve the painting. The Entombment, by Rogier Van der Weyden (664, N.G.), painted on sized linen canvas with some vehicle other than oil, is equally well preserved, and one is inclined to draw the conclusion that a foundation of good linen thread is as safe and durable a ground for tempera as can be found; but two early pictures in the Cologne Gallery on canvas induce the contrary opinion (68 and 69), for they are much darkened and dulled in comparison with other pictures of the same date and school, (compare especially 43). The absence of the protection afforded by the panel at the back seems likely to be the cause of the deterioration. The priming of the linen cloth or canvas for processional banners (*Trattato*, 162) should be noted, made of gesso sottile, a little starch, a little sugar, and size—a coat of size not too strong being first passed over the whole.¹

Everything to be primed must be sized first. Two coats of weak size are best.

The following is the method of the *Hermeneia*: "How to work on canvas with egg, so as not to have cracks. Nail together, first, four pieces of wood, and stretch the canvas on this frame. You will then carefully mix size, soap, honey, and gypsum with warm water, and you will wet the canvas with these two or three times, till it is quite uniform. When the canvas is very dry you will polish it well with the tooth and then you can work with egg. You will attach the gold

¹ There is one of these processional banners in the Italian Court, South Kensington Museum.

to the nimbus with a mordant ; and if you wish you will put on a thin coat of varnish, which answers very well."

No doubt the brilliancy and freshness of the earlier school of oil-painting is partly due to the continued use of gesso and size grounds, and the absence of oil and lead. Among others, Giovanni, Bellini, Giorgione, Titian, Bonifazio, the Bassanos, Correggio, and Veronese are said to have used them, and many of the Flemings ; but another method was to paint the dead colouring with egg or size straight on to the sized linen like the picture by Van der Weyden instanced above.

Armenini¹ gives directions for preparing canvas for tempera-painting, which he, however, speaks of slightly as only used by good masters for those things where haste is required. "Therefore we will treat of it briefly, and first we will begin with the canvases, on which, after they have been well stretched on the frames, two or three coats of weak size are to be laid ; one being on the back side, in order that the canvas may be well soaked, and if the canvas is too stiff another liquid coat, with a little fine flour in it, will fill up the cracks and give an equal surface. There are others who are accustomed to mix with the size some well-ground slaked gesso, which they lay on thinly with a stick ; but if, to carry them from one place to another, the canvases must be folded after they are painted, they might suffer much from this scaling off."

¹ Armenini, 1586, Book II. p. 105.

GILDING

IN Venice before the fifteenth century the painters did not make their own gold backgrounds. This restriction gave rise to litigation; and in a contemporary record a judgment is given from which the following sentence is taken: "We judge it just to permit the gilder to use colour, and the painter to use gilding, when one or the other plays a subordinate place in the finished work."¹

Vasari observed the following inscription under a picture: "Simone Cini, a Florentine, wrought the carved work, Gabriello Saracini executed the gilding, and Spinello di Lucca of Arezzo painted the picture in the year 1385."

But now if any one should wish to make a gold drapery or background, or to gild a frame to be really like the old work in quality, it is no use to go to the trade; not that their gilding is not skilful, for it is, but because some unfortunate modern customs of the spick-and-span class prevent their gilding from having that metallic quality which we rightly admire. This does not depend on the quality of the gold-leaf or on its thickness, but depends on the nature and preparation of the ground, and on the way the gold

¹ Lectures on the National Gallery (J. T. Richter).

is applied. The mischief-making desire of the modern gilder is to make his ground as smooth and level as the face of a plate-glass mirror; this is obtained by immaculate planed wood, and soft whitening grounds laid on very thinly, and water-polished to get this smooth monotonous surface which gives no variety of facets able to reveal the lustre of the gold. Rather than aim at machine-like perfection in mouldings and surface, it is better deliberately to aim at a certain ruggedness and want of finish, and in frames, rounded corners, and obtuse angles and half-choked hollows, for the sake of the gold, that its reflecting planes may be multiplied. Of course a perfect smoothness to the touch—like satin—is essential in a gilding ground. Follow the method of the *Trattato*, and the work will be as overlaid with gold. But it is a very difficult art to acquire in perfection. The tools are the same now as then, and can be bought. The present practice is usually to take up the sheets of gold on the tip of an equally wide brush of badger's hair, which is sometimes lightly passed over the hair of the head first, to make the gold adhere sufficiently to the brush. It is difficult to manage more than half a sheet at a time. Burnishing can be done bit by bit as the work proceeds, twenty minutes to half-an-hour after the leaves are laid on. This requires great lightness and care, or the gold will be rubbed off by the burnisher. Most old gilding is burnished sufficiently to give a beautiful lustre, but not so much as to rob it of its yellow colour by being too strongly reflecting. Gilding must either be burnished or have

a thin size or shellac layer passed over it. A very weak and very clear parchment size with a few drops of spirits of wine in it will do. In trade gilding this is generally an unnecessarily sticky thick coating, attracting dirt and becoming brown. Ready-prepared mixtures can be bought called *ormolu*. The fine silver varnish mentioned p. 264 answers very well. Until this is done the gilding is full of creases and would rub off. White of egg or *glair* is only used now by bookbinders; trade gilding is done with parchment size, or with gold size, that is, oil-mordants. Size is not so durable as egg, and oil-gilding cannot be burnished.¹

There are many variations of the ground to be used under gold in books. Sometimes bole is added, sometimes *biacca* is omitted, sometimes honey is used instead of sugar.

Gold-leaf can be bought now of any thickness from first-class gold-beaters.²

Nothing should be used but that called 'fine gold,' which is as pure as is possible. Double fine gold is thick enough to gild in one layer. Gold-leaf at fifteen shillings per book of twenty-four sheets is like tinfoil in substance.

Cennino complains that goldsmiths made from a ducat 145 leaves of gold instead of 100, this not being in his opinion thick enough for flat surfaces. The Venetian ducat and the Florentine gold florin, first

¹ Modern gilding methods are described fairly fully in such books as "Workshop Receipts," by Ernest Spon.

² For instance Whitley, Whitfield Street, W., who also sells an admirable pure ground gold used by French gilders, with which on a proper ground burnished gold can be made.

struck in the thirteenth century, both weighed 54 grains, or about $\frac{1}{8}$ oz. In the Lucca MS. the gold-leaf is beaten from an alloy of a sescuncia of gold and another of silver. Two sescunciæ are three ounces. From this 1024 leaves were made. Three ounces of gold would make 2700 of Cennino's thickest leaves. The size of a leaf was probably the same. In the *Schedula* (I. xxiv) the parchment sheets of the books in which the gold was beaten were to be square pieces, measuring each way the breadth of the four fingers, that is, about three inches. Gold leaves measure about this now, and are beaten in the same way. Vasari (Introd. xxviii) gives their size as the 8th of a braccio (the Florentine braccio was 23 inches), and says that in his time 1000 pieces were worth about three ducats including the labour. Nowadays ordinary gold-leaf weighs about 4 to 5 grs. for 25 sheets, worth $\frac{1}{4}$ of a shilling, or about 2500 are made from an ounce, or, it is to be presumed, about 1200 of double leaf, as against 900 in Cennino's time. Pure gold is frequently used for out-of-door gilding in London, as, for instance, the statue of the Albert memorial.

Among the accounts of the expenses of decorating with painting the royal chapel of St. Stephen at Westminster in Edward III.'s reign, we find that John Lightgrave paid for 600 leaves of gold at the rate of five shillings the hundred.

The gold-leaf used by the Greeks was thick. The famous Erechtheum inscription of 404 B.C. gives one drachma as the cost of each leaf ($\pi\acute{\epsilon}\tau\alpha\lambda\omicron\nu$) used for gilding the marble enrichments.

Some of the books of gold of the ancient Egyptians have descended to us. There is one in the Louvre (*Salle Funéraire*, Case Z).

Pliny's gold-leaf was the square of the breadth of four fingers. One ounce, he says, can be beaten into 750 leaves. In his time gilding was already used on plastered walls, and in Book xxxiii. c. 2 he treats of engraving on gold and silver in connection with painting. White of egg and size were the mordants.

If tempera-painting is done on a gold ground, before the paint is thoroughly dry, that is, within a few weeks of being done, it can easily be scraped from the gold, in fine lines or more completely. A great deal of gold patterning is done in this way in early pictures, and not laid over the paint with mordants. This is perhaps the meaning of the word *grattare* (c. 4, note) which I have translated 'engrave in lines.' It is best, unless the paint is quite fresh, to moisten it before scratching the lines through it.

Egg-paint is liable to crack from gilding, unless the gilding is finished with an ormolu or lacquer (see above), or extremely weak parchment size containing a few drops of spirits of wine answers the purpose. The first coat of paint must not be put on till this is thoroughly dry (dried for a day or two), and then it must be washed on thinly and lightly, and should be similarly dried, and great care must be taken not to disturb these preparatory coats in doing the subsequent painting.

ABOUT CENNINO'S PIGMENTS¹

IT would be antiquarianism to limit ourselves in painting to the pigments available in the fifteenth century. As was evidently done by the school Cennino represents, we should exercise a wise eclecticism, and in doing so, should reject for some purposes pigments which he employed, having now better ones.

Church's "Chemistry of Paints," and Laurie's "*Processes, Pigments, and Vehicles*" should be studied by every painter. It is, however, certain that colours which we consider dangerous or fugitive have been employed successfully both in tempera and oil painting. In tempera probably a great deal is due in the way of permanence to the protecting final varnish, which can always be renewed when needful.

Black (c. 37).—Practically prepared from the same materials now, adding burnt bone and ivory. Black earth is not now used as a pigment. Black earth of Rome and of Venice is mentioned by other writers. *Terre noire* is mentioned in the De Mayerne MS. (quoted by Eastlake, I. p. 466): "Qui facilement se

¹ For information about pigments of the whole Renaissance period I would refer especially to the Introduction to Mrs. Merrifield's "Ancient Practice of Painting" and her "Fresco Painting." The notes to the German translation of Cennino refer to numerous passages in other early writings where the pigments are mentioned.

seiche, est gras et s'étend fort bien et vaut mieux que le charbon commun . . . le bleu noir, pour peindre satin, &c." Blue black decolorises organic pigments by precipitating their particles. Ivory black and its cognates does this in a greater and lamp-black in a less degree, according to Professor Church, but lamp-black has always borne the worst character. "Le noir de fumée est venin parmy les autres couleurs ainsi que le verdigris."¹ Vasari speaks of its injurious effects in the Life of Raffael and of Bartolommeo. Leonardo (*Trattato*, c. 353), Hoogstraten (see Eastlake, p. 466), and Lebrun condemn it. Mérimée, however, in his "Oil-Painting," says that, well calcined and washed, it may be used without danger.

Sinopia (c. 38).—This must be taken as the generic name given first to the red earth of Sinope, but including all bright red ochreous earths. The most valued was the rubrica of Lemnos, which came nearest to the colour of vermilion, and with this (as well as with red lead), according to Pliny, 'they give the undercoating to minium' (vermilion). In the Lucca MS., which hands on the classical methods, Sinopia is mentioned as making, when burnt and mixed with red lead, a colour similar to cinnabar (vermilion again). In later northern documents sinopia means madder. Native red earths are perfectly safe, and light red, which ought to be calcined yellow ochre (also known to the ancients), but *Venetian* reds now are often artificial, and seldom free from soluble salts and sulphates,

¹ Brussels MS.; "Ancient Practice of Painting," Vol. II. p. 823.

and may injure other colours. Artificial ferric oxides are also more likely to darken than natural earths.

Natural red earth is one of the earliest colours to be mentioned. The Greek name for red earths was *miltos*, and this is the word used in the Septuagint in Ezekiel xxiii. 14, 15, where we have vermilion. Jerusalem gives her erring love to "the men portrayed upon the wall, the images of the Chaldeans portrayed with vermilion (*μῖλτο γραφίδι*), girded with girdles upon their loins, exceeding in dyed attire upon their heads, all of them princes to look upon." See also Jerem. xxiii. 14: "Ceiled with cedar and painted with vermilion." Homer mentions that the Greek ships were painted with this *miltos*, which shows the high estimation in which it was held. He hardly speaks of other colours at all. It is evident from Pliny that all red colours, especially vermilion and purpurisum, the shell-fish crimson, appealed to the splendour-loving Romans, as the celestial blue of ultramarine appealed to heaven-seeking Christian painters. Pliny's praise of purpurisum is quite a poem. Agobard (779-840), in his controversy against images, says: "For not yet had the error arisen by which now pictures (*effigies*, portraits) represented with charcoal, minium, or sinopia were called holy images and were ordered to be worshipped." A monkish writer of saints' lives in the ninth century speaks of one Willelmus Dux, "who was wont to pass his time in palaces shining with gold and painted with sinopis." Pliny says "sinopia is used both for painting with the brush and for colouring wood . . . that which is of the

deepest red is most in use for colouring compartments" (in wall decorations). Probably this was the pigment used by Theophilus for reddening wood (L. I. c. 22), and the rubeum which could be mixed with lime on a wall under cinnabar. From other passages in Theophilus, where it is used as a shadow colour, it seems to have been a dark red, perhaps the usta of Pliny, without which he says shadows cannot be made, and which was variously a burnt ochre, an Asiatic colour called *purpurea*, very likely Indian red, also red lead. Red earths are extraordinarily enduring on plaster, as may be seen in many an old church, where little else remains of the original frescoes. Sinopia was one of the four colours that Apelles used in what Pliny thought the 'grand style.'

Cinnabar (c. 40) is our vermilion, a sulphide of mercury. The Romans and Greeks used the natural ore, and called it respectively *minium* and *cinnabar*. *Minium* now means red lead, which was used to adulterate the more costly mineral, and at last received its name. The true *minium* was the colour of pomp and triumph. It was used to paint the face of the image of Jupiter and the bodies of the victors in the triumphs. It came to Rome from Spain, where it was said to be found with the ores of quicksilver, and formed part of the revenues of the Roman people. "Indeed there is nothing guarded with a more constant circumspection, for it is not allowable to reduce and refine the ore upon the spot, it being brought to Rome in a crude state, and under seal, to the amount of two thousand pounds per annum. At Rome the process of washing

is performed, and in the sale of it the price is regulated by statute, it not being allowed to exceed seventy sesterces per lb."¹ In spite of precautions, it was much adulterated with red lead, red arsenic, and red ochres. A more justifiable economy was under-painting with red lead—no doubt in the large flat spaces of house decoration.² "One motive, however, of giving an undercoat of syricum (red lead) to minium, is the evident saving of expense that results therefrom. Minium, too, in another way affords a very convenient opportunity to painters for pilfering by washing their brushes filled with the colouring matter every now and then. The minium, of course, falls to the bottom, and is thus so much gained by the thief" (Pliny). After the classical writers, until the sixteenth century³ there are no allusions to the natural ore. In the Lucca MS. of the eight century there is the first clear account of the process for making artificial vermilion by the sublimation of mercury and sulphur; and through the Middle Ages the recipes for this are numerous. Two distinct methods are now known, called the dry or Dutch way, and the wet way, which has superseded the other in Europe. The dry method is continued in China, and Chinese vermilions should be used by artists, as the vermilion produced by sublimation is undoubtedly more permanent than that made in the wet way.⁴

¹ Pliny, L. xxxiii.

² In newly uncovered decoration at Pompeii, vermilion of magnificent colour may be seen.

³ "Ancient Practice of Painting," p. clxxii.

⁴ "Chemistry of Paints." p. 149.

Except for one peculiarity vermilion is a most reliable colour. This is that the scarlet pigment is identical in composition with black sulphide of mercury, and sunlight is able without any other agent to turn the red crystalline, into the black amorphous form. When locked up with oil and varnish this change does not take place. Apparently it does not take place in tempera either, being often brilliant, where the rest of the picture has faded or darkened. I am speaking of pictures in the ordinary light of galleries and churches. Vermilion has also usually lasted perfectly in frescoes in rooms. The change was well known in open-air frescoes. Pliny and Vitruvius mention the injury caused by the sun's rays and the moon's rays, and to guard against it give a method of varnishing with oil and wax. Some such protection is supposed to have preserved vermilion in the wall-paintings of Pompeii. The change has been most frequently noticed in MSS. Professor Church notices the capricious change which has taken place in the same MS. in initial letters: "I have more than once observed that, while all the vermilion used in one part of a missal or choral-book has remained red, a leaden hue has spread irregularly over the rest of the work in places where this pigment has been used." He conjectures that this is owing to the employment of a different sample of vermilion or a different technique.¹ I think that the deliberate mixture of red lead with vermilion by miniaturists may partly account for these changes. In the MS.

¹ "Chemistry of Paints," p. 150.

of St. Andemar, for instance (thirteenth or fourteenth century), we find in two consecutive recipes directions for mixing vermilion and minium for illuminating a manuscript. He remarks that this mixed minium will turn black in the sun, and if a thickly painted letter does not dry well it must be dried at the fire. Mérimée mentions the rapid discoloration at a picture exhibition of a drapery painted with red lead. Professor Church excludes red lead from his list of artist's pigments.¹ No doubt vermilion varies in quality according to the thoroughness of the sublimation and the washing it undergoes. The best now, as Cennino thought, is that which is formed at the top of the retorts. Special attention was paid by the missal-painters to the thorough incorporation of vermilion with its tempera. In the Strasburg MS.² (59a)—beginning fifteenth century—it is to be ground with gum, and a few drops of yolk of egg and clarified white of egg was added for the actual painting. In the Bolognese MS. (224) washing with ley and then water is directed; the tempera is white of egg and fig-juice and saffron, and a little yolk if more body is wanted, with *ear-wax* to prevent gloss.

According to Professor Church, the different shades are principally obtained by regrinding and washing over, the coarser grain being inclined to crimson. This tint is probably more permanent than the orange tint.

In old treatises we must always judge from the context what pigment is indicated by any name.

¹ Mérimée's "Oil-Painting," p. 112, note.

² Published in *Beiträge*.

Vermiculum generally means kermes lake—a hard red ochre is sometimes called mineral cinnabar. Cinnabar meant vermilion to the Greeks, but to Pliny dragon's blood. Minium, sinopia, azzurro, giallorino, indigo, lake, have varying significations according to the place and period. This list could be extended.

C. 41.—Red (tetroxide) lead when fresh has an exceedingly fine orange colour—but no way is known of preserving its freshness. It should not be used in the sulphuretted air of our towns. Possibly the wonderful flaming drapery in Michael Angelo's Entombment (N.G.) is painted with it.

Amatito (c. 42).—Hæmatite is another name for the ferric oxides which supply us with Indian red and other ochres; but it occurs in a great many different forms, some of them hard and crystalline, and it seems probable that some such variety very crimson in tint was known to fresco-painters. Vasari mentions the stone by the name of *matita dura*, which when ground was to be used with the *matita rossa*.¹ Mrs. Merrifield received specimens of hard and soft hæmatite from Roche in Cornwall. Calcined, she found it varied from lake to violet, according to the length of time it was exposed to the fire. It is worth noting that in Cennino's time cardinals (he says the pigment makes their colour) wore purple. They received the red hat in 1247 from Innocent IV., but they did not adopt the red dress till 1464, under Paul II. In the Bolognese MS. (136) we find

¹ Introd., c. xxxii. See similarly Leonardo, *Trattato*, c. 353.

that a strong alkali is to be added to Brazil-wood crimson, to turn it violet and make cardinal-colour.

Dragon's blood (c. 43).—The popular name of the inspissated juice or resin of several plants, as *Calamus draco*, *Pterocarpus draco*, and especially *Dracæna draco*, the dragon-tree of Teneriffe.¹ The colour is more like that of blood than any other, and this may have given rise to Pliny's fable; he defines cinnabar as the thick matter which issues from the dragon when crushed beneath the weight of the dying elephant, mixed with their blood (xxxiii. 38). It is now used for tinting spirit and turpentine varnishes, and by chemists to colour drugs. I have seen in an early English picture, exhibited at the Society of Antiquaries in 1896, a wonderful transparent blood-colour in varnish which was conceivably this pigment.

Lacca (c. 44).—Real and artificial madders have replaced other lakes. What pigment was used to produce the lovely pinks and crimsons of the early Italian painters is not really known with exactness. Madder is scarcely mentioned in Italian documents between the Lucca MS. and the middle of the sixteenth century, though known in the north. Their raw materials were kermes—*i.e.* the bodies of the *Coccus illicis*—gum lac, which was imported into Venice, and Brazil-wood or verzino. The kermes grain was in great repute for a permanent dye. Piers Plowman describing the dress of a lady richly clad, says her robe was of 'scarlet in grain,' that is, scarlet dyed with grana.² The painters seem to have always extracted the dye from the cloth

¹ Imperial Dictionary.

² "Vision," written about 1350.

instead of direct from the insect. Kermes lake seems to incline to blood-colour, and lac lake towards rose or pink. The lakes of Florence and of Venice were both celebrated; the latter, judging from the colour, were probably lac. In the fourteenth century Florence and Venice were celebrated for their red stuffs dyed with kermes, which were largely exported. As early as 1220 the Provençals imported lac for dyeing. Some old pinks and crimsons are hardly to be imitated by madder colours. The balsams seem to prevent the fading of lakes which are generally considered hopelessly fugitive.¹

Yellow ochre (c. 45).—This perfectly permanent pigment needs no comment except that it is best to use the natural earths rather than artificial ferric pigments, which have more tendency to redden. In tempera they are variously good as driers. A genuine yellow ochre dries admirably. Raw sienna and burnt sienna are not so drying in body, but, being transparent by nature, glaze well. This was one of the four pigments of Apelles, according to Pliny, who expresses regret at the conquest of splendour over simplicity. "Four colours only, white from Melos, attic yellow, red from Sinope on the Black Sea, and the black called atramentum were used by Apelles, Ætion, Melanthios, and Nikomachus in their immortal works, illustrious artists, a single one of whose pictures the wealth of a city could hardly suffice to buy; while now that even purple clothes our walls, and India contributes

¹ See especially on this subject, Cantor Lectures (A. P. Laurie), p. 31.

the ooze of her rivers (probably indigo, perhaps a red) and the blood of dragons and elephants, no famous picture is painted. We must believe that when the painter's equipment was less complete the results were in every respect better, for, as I have already said, we are alive only to the worth of the material, and not to the genius of the artist."

Giallorino (c. 46).—The word is a diminutive of *giallo*, and means pale yellow. There is no doubt that Cennino believed his pale yellow to be a native mineral of volcanic origin, but the school of mines can give no clue to a native bright yellow mineral antimoniate of lead which, artificially made, has for a long while been considered the true Naples yellow. Marcucci¹ says that *giallo di Napoli* is a compound of yellow oxide of lead and the oxide antimony. Gerolt states that a native massicot of a sulphur-yellow colour (lead deutoxide) has been ejected from some of the Mexican volcanoes and collected in considerable quantities along the streams. Massicot was found by Branchi in analyses of old pictures at Pistoia. True artificial Naples yellow is hardly to be had now, nor can it be called a very safe colour, as it blackens rapidly from mere traces of sulphur compounds. Aureolin (cobalt yellow) and middle cadmium are better and more reliable colours. Aureolin is slowly turned red if painted with bad egg, I suppose because the sulphur liberated by decomposition makes a red compound with its cobalt base. For the same reason (the

¹ *Saggio*, p. 66.

presence of sulphur) it may be unadvisable to mix cadmium with aureolin. Cadmium blackens emerald green.

Orpiment (king's yellow), c. 47.—The auripigmentum of the ancients, a natural yellow sulphide of arsenic brought now from Vesuvius. It can be mixed with no colour containing lead or copper. In Eraclius (iii. 57) we find "orpiment has no light tint, because it mars all colours." Bright yellows were few, so the old painters all used it, giving all kinds of conflicting directions as to the best tempera for it. White made from calcined stag's horns was used to lighten it. It has the best chance alone, over yellow ochre. Most often the tempera is yolk of egg. Vandyck painted it by itself, with ground glass to make it dry. Professor Church says it fades, and condemns its use.

Risalgallo (c. 48).—Realgar or red orpiment; see above. A lump of realgar in egg-vehicles was often recommended to keep them sweet.

Zafferano (saffron), c. 49.—Wholly disused for artistic purposes.

Arzica (c. 50).—It is not impossible that massicot is intended—called azarcon in Spain.

Verde-terra (c. 51).—Permanent and reliable. In tempera not a very good drier. It is pleasant under gilding where a cool tone is wanted, but does not hold the gold as well as bole. Cennino gives here some justification to Vasari's assertion that Margaritone first used bole in gilding, but Pliny's ground was red (see also c. 133).

Verde-azzurro (malachite), c. 52.—A carbonate of copper, and closely allied to *azzurro della magna*. It is the *chrysocolla* of Pliny. It has sometimes lasted well both in oil and tempera, probably when well protected by a hardened vehicle. It is blackened by sulphur. The usual name is green verditer.

C. 53.—Indigo is one of the few colours that can be mixed with orpiment.

Verderame (verdigris), c. 56.—There is no safe way of using this very beautiful colour (acetate of copper) except in a spirit or turpentine varnish. It was usually tempered with wine alone for MSS. The green drapery in Van Eyck's Arnolfini is thought to be painted with it, and the presence in the varnish of Venice turpentine or a similar balsam may account for its freshness.

Bianco sangiovanni (c. 58).—The fresco white.

Biacca (white lead), c. 59.—The *cerussa* and *psim-mithin* of the ancients; the only white pigment of the Lucca MS. and of the *Schedula* and the *Hermeneia*, except for wall-painting. It was the pigment universally used in tempera and missal painting. Nothing could be fresher than the white portions of tempera pictures, but the ever-present sulphuretted hydrogen of modern life makes the use of zinc white preferable, especially as it works well and there is no objection to its use, and it is not affected by sulphur compound. The cup-shaped top of the cakes of white lead mentioned here is given on the Continent by pressing it into unglazed pots and drying it to a solid mass in stove-rooms; a process most injurious to the workers, and unknown here.

Cennino's Pigments 257

Azzurro della magna (c. 60).—Mountain blue, or blue verditer, *i.e.* blue carbonate of copper—perhaps Pliny's armenium.¹

This beautiful colour has a tendency to become green, especially in tempera, and now that we have cobalt and French ultramarine may perhaps be dispensed with. There is often some confusion between this azure and that from the lapis-lazuli. The Bolognese MS. distinguishes clearly between this latter coming from beyond the sea (*ultra mare*) and the German or Teutonic azure (azurrum almanicum or d'Allemania). The price of true lapis-lazuli stones is here given at 2 to 5 ducats the pound, and of the others at 12 to 30 bolognini (bolognini=six quattrini= $\frac{1}{2}$ d.), and the best ultramarine is said to be worth 5 ducats per ounce, and the German 1 to 3 ducats the pound. Pacheco relates that when Philip Count of Flanders had a copy made of Van Eyck's Ghent picture they sent to Titian, who was at Venice, for some of a natural azure, which is found in Hungary, which was formerly very easy to procure before the Turks were masters of that province. This must have been the blue carbonate.²

The German chemist J. F. John found that the greens on the temples and tombs at Thebes were a copper blue mixed with a vegetable yellow, held on by size. However, this might perhaps be the artificial Vestorian blue copper-frit.

¹ Beautiful specimens of this and malachite may be seen at the School of Mines, Jermyn Street, W.

² "Ancient Practice of Painting," Vol. I. xlv.

Indigo (c. 61).—This colour, the juice of the *Indigofera tinctoria*, was known from classic times, and was also imitated with woad. It seems often to have been used in fresco, but must be reckoned a very fugitive pigment however employed. Its bad character is indicated in the following passage from the *Liber Horn*, fol. 341, temp. Edw. II.: "Rules as to painting old and new saddles.—It is provided that no one put any but good and pure colours upon gold or silver, that is to say, good cynople (madder), good green, good vermillion, or other colours, tempered with oil, and not brasil (logwood), indigo of Baldas, or any other bad colour."

Azzurro oltre marine (c. 62).—It is uncertain whether the ultramarine of the lapis-lazuli was known to the Romans, or whether their native cyanus was the blue carbonate of copper. It was highly valued, almost revered, in the Middle Ages. It was often specially stipulated in contracts, most often supplied by the person who ordered the picture, as was usual in the case of several of the brighter pigments in Roman times. Vasari tells a story about ultramarine like Pliny's about the pilfering of vermillion (p. 248). When Perugino was painting in the convent of the Ingesuati, the prior, who himself prepared ultramarine blues, wished them to be used, but was suspicious of the painter, and insisted on being present while he was painting with them. Perugino outwitted him by the same trick, but in the end returned him his blue with a wholesome admonition against distrust. Ultramarine was deemed a gift worthy of kings, and the free

use of it in the church of Assisi, for instance, is witness how lavishly it was bestowed. A vase is treasured there which contained a gift of it from the Queen of Cyprus. In Le Bègue's French recipes it is said to be worth its weight in gold, which sounds priceless for a paint, and now the best costs retail just twice its weight in gold, yet a drapery or a sky may be painted with it, in tempera, at least without any excessive expense, for its power and covering qualities are enormous. It is the purest blue there is, and the sky blue which best retains its colour under artificial illumination. As is always the case with natural pigments, it is more permanent than artificial ultramarine, and is also more beautiful. Cobalt, it is true, replaces it for most purposes, and is as permanent, but its colour is more purplish.

The method of preparation of the 'ethereal colour,' as St. Audemar calls it, is very frequently given, and is the same as here in the *Trattato*, with unimportant variations.

The advice in c. 82, to make as few folds as possible in an ultramarine drapery, accords with what we can see for ourselves in pictures, and with the pleasure that we take in the blue depths of an untroubled, cloudless sky. As to the advisable tempera for ultramarine, I have not been able to see the necessity for size, as yolk of egg does not spoil the blue colour. Oil undoubtedly does alter it. This pigment and the madders might be injured in tint by mixing vinegar or acetic acid with the egg, but I have not noticed any change. It would be immediate, as the acid evaporates.

The great cost of ultramarine is shown by the fact that a copy of the Vulgate belonging to Corpus Christi College, Cambridge, has been robbed of the ultramarine backgrounds of its numerous miniature pictures, no doubt scraped off to use again by some mediæval scribe.¹ This is not a solitary case of such robbery.

Ultramarine is a very compound substance, silicon, aluminium, sodium, sulphur, and oxygen being all found in it; and combinations of these with other materials, as charcoal, are used in the manufacture of the artificial pigment.

These scrappy notes will fulfil their object if they enable a few readers to realise the love of the early masters for their pigments, like a musician's for his violin; and if they incline others to study the subject more thoroughly and practically. They can be no substitute for such manuals and texts-books as have been already mentioned. Other books of reference—"A Practical Treatise on the Manufacture of Colours for Painting," Riffault, Vergnaud, and Toussaint, translated from French by A. A. Fesquet, 1874; *Bulletins des Commissions Royales*, Belgium, xxii. 1883.

¹ See "Illuminated MSS.," Middleton, p. 241.

ON EARLY VARNISHES

PANEL-PICTURES of the period of the *Trattato* seem to have been varnished as a matter of course. The Statute of the Guild of Painters of Venice of 1272 orders that no picture should be sold unvarnished. It is usually considered that the pale greenish scheme of flesh colouring adopted was intended to compensate a warm yellow or red-toned varnish. It seems to me, however, that this is doubtful, for the varnish would have the same toning effect on the reds and whites, and the freshness of these was so prized that even an egg-yolk of a dark tint was to be avoided, and this really makes very little difference (see c. 147). The same pink and white freshness is praised in an old German poem describing a portrait :—

“ Her colour bright and good,
Shone like milk and blood,
Red and white well mingled,
With varnish and white paint.”

“ Ir varwe licht unde gût
Rehte als milich und blut
Wol gemischet rôt und wîz
Âne blank und an verniz.”

—*Eneide of Heinrich von Valdecke*, 1155–1184.

It is clear that Cennino wished for as pale a varnish as could be procured (c. 155).

The question what this varnish was composed of has been discussed frequently, and it seems to be accepted that it was sandarach resin¹ dissolved in a fixed oil; but it can be shown that several varnishes were probably known in Italy at that time which would be paler than sandarach, as that has a reddish tint. In the Strasburg MS. (German, beginning of fifteenth century), about contemporary with the *Tratato*, there is the following passage: "This little book teaches how all colours are to be tempered for painting according to Lombardic customs . . . and teaches also to make three kinds of varnish." There is some little doubt about the word translated Lombardic. The recipes for the varnishes are not so clear as might be wished, but they are probably: (1) either amber or sandarach, (2) mastic, (3) Venice turpentine, boiled with linseed, hemp-seed, or old nut-oil. All oil-varnishes darken with time, and we now use a spirit mastic varnish on pictures. A fourth varnish in the Strasburg MS. is oil, mastic, and terpentuum; this may be spirits of turpentine, but the resin seems more likely to be intended.

Some of the early varnishes contain ingredients which would give them a yellow colour. This is the case with both the elaborate compounds in the Lucca MS., one for colours and the other for gilding, if *floræ puppli* is an alchemical term for orpiment (Berthelot). The first is described '*de lucide ad lucidas*' (of the lustre for transparent painting). It consists of amber, mastic, three kinds of turpentine

¹ See especially Eastlake, "Materials."

resin, galbanum, myrrh, two gums, and a small quantity of linseed oil, besides this floræ puppli. The varnish for gilding is nearly the same, with the addition of saffron. One is strongly reminded of the multifarious and arbitrary combinations of the ancient *materia medica*. Later on varnishes became simpler, as in the *Schedula* (see p. xxix), but later again, especially in Italy, they were often compound, and the balsams which have been shown lately to be very efficacious in preserving fugitive pigments, that is, Venice turpentine and olio di abezzo, play a conspicuous part in them. I have recently become acquainted with an inherited compound varnish of amber and balsam and mastic, with a little oil and spike-oil, which has been 'proved' through the lives of a father and son. Although amber is a dark varnish, it is not certain that it darkens. Colours mixed with it can be kept from the light without darkening. I have not yet been able to test this varnish on tempera, but I hope to do so.

It is commonly stated that old tempera pictures become penetrated with their varnish, and cannot be distinguished from oil. On the contrary, most fourteenth and fifteenth century tempera-work has shed the original varnish by this time, spontaneously or with assistance. It does not seem to sink in at all. I have seen all the varnish crumble away from a recently painted tempera picture which was hanging on a rather damp wall, and the picture remained uninjured. I varnished another myself with a mastic varnish which turned out to be of poor quality, and

I washed it off with pure rectified spirits of wine without injuring the picture at all.¹ A mastic spirit varnish is the safest for tempera, but a good shellac varnish² is sometimes useful. It gives a slight gloss, very pleasant, but I am afraid it is not very durable.³

I have not found it necessary to size work before varnishing, and an experiment that I tried was unsuccessful, even disastrous.

The practice of drying pictures in the sun may have arisen from the varnish containing one of the slow-drying balsams, and not only from the oil composing the varnish not being sufficiently well prepared.

In the *Hermeneia* there are directions for a method of preparing balsam, *i.e.* turpentine resin, so as to be fit to enter into the composition of varnishes.

It is certain from experiments (John) that the Egyptians had oil-varnish, and Pliny can scarcely have meant anything else by his atramentum, through which the picture was seen as through talc, also by the 'splendour' added under the reign of Augustus.

¹ Tempera cannot be washed with water without great risk. Pure benzine may be used.

² Fine silver varnish (Gedge, John Street, Spitalfields). Really a lacquer.

³ Mr. Spencer Stanhope told me he thought tempera never dries completely in this country, and should not be varnished, but I think this is not true.

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INDEX

INDEX

NOTE.—*The text is referred to by chapters, the rest of the volume by pages.*

- ACETIC acid, with egg-vehicles, p. 211
- Aetius, p. 221
- Albumen, c. 132; pp. 210, 211. *See also* Egg-vehicles,
Whole Egg
- Alum, cc. 161, 173
- Aluminous earths used in adulterating oil-paint, p. 214
- Amatisto, pigment, cc. 18, 42, 72, 74, 76, 80; p. 251
,, for burnishing, cc. 42, 135, 136. *See also* Bur-
nishing Stone
- Anonymous *Bernensis*, p. 196
- Apprenticeship, p. xi; cc. 2, 3, 4, 104
- Arabian science, p. xxvi
- Armenini, pp. 218, 238
- Arzica, cc. 50, 54; p. 255
- Ashes used in casting, c. 182
,, ,, in grounding, c. 170
- Asiso, cc. 157, 158
- Athos, Mount, painting at, pp. xxvii, xxxi-xxxiii; pp.
216, 217
- Atramentum, black paint, p. xxviii; p. 253
,, a varnish, p. 264
- Audemar, St., the MS. of, pp. xxix, xxx, 222, 223, 234

Aureolin, p. 254

Azzurro della magna, cc. 36, 50, 52, 54, 60, 61, 72, 83, 146 ;
p. 257

BALSAM, p. xxi ; pp. 220, 253, 256

Banners, painted, cc. 162, 165 ; at South Kensington,
p. 197

Bazzeo, *i.e.* verdaccio, c. 67

Beer, p. xxx

Biacca, *see* White Lead

Bianco sangiovanni, cc. 36, 39, 57, 58, 61, 67, 68, 69, 71,
72, 75, 76, 78, 80, 93, 144, 150 ; p. 256

Black, pp. xx, xxxvi, xxxviii ; p. 244

„ how to make, c. 37

„ uses of, cc. 22, 67-69, 72, 78 *et seqq.*, 147, 172, 173

Black crayon, c. 34

Bole, Armenian, pp. xxxiii, xxxviii ; cc. 4, 37, 119, 131-
134, 141, 152, 158, 162, 165, 168, 174 ; pp. 241,
255

Bolognese MS., pp. xxx, 232, 250

Bone-dust priming on tablets, cc. 5-8

„ „ on paper or parchment, cc. 10-12, 16

Boxwood tablets, c. 5

Bran-water, p. 216

Brazil-wood, cc. 62, 161, 173 ; p. 252

Brushes, hog's bristle, c. 65

„ minever, cc. 64, 67

Burnishing gold, *see* Gilding

„ parchment, c. 17

„ stone, cc. 17, 42, 135, 136

„ teeth, c. 135

Byzantine influence and tradition, pp. xv-xviii, xxv, xxvii

- CAMPHOR to preserve egg, pp. 207, 211
 Candy in parchment gilding ground, c. 157
 Canvas for painting grounds, pp. xxxiii, xxxiv; cc. 162, 185; p. 218
 Casting, c. 125
 „ from living body, cc. 181, 186
 „ from wax impressions, cc. 187, 188
 Ceruse, *see* White Lead
 Cervisia, *i.e.* beer, p. xxx
 Chalk for grounds, pp. xix, xxi, xxix, 230, 232, 233
 „ for casting, c. 125
 „ tailor's, for drawing, c. 163
 „ „ for gilding-ground, c. 168
 Charcoal, as a pigment, cc. 37, 177
 „ crayons, c. 33, 122
 „ drawing with, cc. 30, 67, 90, 122, 162, 164
 „ to polish stones, c. 136
 „ to turn damp, c. 174
 Cheese-glue, c. 112
 Chestnut-flour paste, c. 105
 Cinabrese, cc. 39, 67, 71, 72, 147, 177
 Cinnabar (vermilion), pp. xxviii, xxxvi-xxxviii; cc. 40, 42, 72, 141, 143, 144, 147, 149, 173; pp. 220, 245, 247-251
 Clarea, *see* Egg-vehicles, White of Egg
 Cloth, decorative painting on, cc. 163, 164, 167, 173
 Clothlet colours, cc. 10, 12, 161
 Coffers, decoration of, cc. 128, 170
 Colla di spicchi (a glue), cc. 25, 109, 113
 Colour-box, cc. 36, 93, 172
 Crocus, *see* Saffron

 DECORATIVE painting, cc. 163-170, 173, 177
 Dionysius, author of *Hermeneia*, p. xxxii

Dioscorides, p. 221

Dragon's blood, c. 43 ; p. 252

Drapery-painting, directions for—

in fresco with cinabrese, c. 71

„ „ with other pigments, cc. 74-78, 80, 84

in secco with ultramarine, c. 72

„ „ with other pigments, *see* Secco

in tempera with lake, c. 145 ; pp. 200, 205

in oil, cc. 93, 143, 144 ; pp. 226, 227

Drapery, changing or shot, in fresco and secco, cc. 77, 78
79, 80, 81

of azzurro della magna, c. 83

of gold, cc. 104, 123, 141-143

of colour over gold, cc. 141-143

of silver, cc. 142, 143

of natural shades of ultramarine, c. 146

of purple, c. 146

like silk, c. 144

like velvet, cc. 143, 144

like wool, c. 144

EARTH colours, c. 36 ; p. 244, 246, 253

Egg-vehicles—

White of egg, in Pliny, p. xxi ; in Papyrus, p. xxiii ; in
Lucca MS., p. xxiv ; in *Hermeneia*,
p. xxxiii ; in *Schedula*, p. xxix ; in thir-
teenth-century MSS., p. xxx ; in Stras-
burg MS., p. xxxv

„ „ analysis of, p. 210

„ „ as a varnish, c. 156

„ „ as vehicle for ground gold, c. 160

„ „ „ „ for painting, cc. 10, 172

„ „ gilding with, *see* Gilding

Egg-vehicles, *continued*—

- White of egg, mixture of, with fig-milk, pp. 184, 212
 " " " with gum, cc. 158, 159, 185;
 p. 208
 " " " " preparation of,
 p. 209
 " " " with size, for priming and
 gilding, cc. 162, 165, 166
 " " " with wine, p. 184
 " " not to be used stale, cc. 10, 134; p. 207
 " " preparation of, for gilding, cc. 131, 132,
 157
 " " " for painting, pp. 207, 208
 " " tempera, nature of, p. 211
 " " used to make tempera paint lie over
 varnish, c. 170
 Whole egg, in Pliny, pp. xx, xxi; in *Hermeneia*,
 pp. xxxiii, 237
 " with fig-milk for secco, c. 72
 " " " " modern experiment
 with, p. 212
 " " " " for priming on wall
 under oil, c. 90
 Yolk of egg, in *Schedula*, p. xxviii; in thirteenth-cen-
 tury MSS., p. xxx; in *Podlinnik*, p. xxxv
 " " mentioned by Vasari and Armenini, p. 184
 " " added to white of egg, p. xxx
 " " alkaline reaction of, p. 211
 " " analysis of, p. 210
 " " as solvent of varnish, c. 179
 " " as vehicle for drawing with white on paper,
 c. 32
 " " drying qualities of, pp. 187, 211, 212

Egg-vehicles, *continued*—

Yolk of egg, experiments in mixtures with, pp. 185,
186, 213

„ „ for secco, cc. 72, 83, 146, 218

„ „ how to preserve fresh, p. 207

„ „ in painting human face, c. 179

„ „ methods of painting with, pp. 194, *et seqq.*

See also Panel, Tempera

„ „ mixed with mead, p. 184

„ „ „ „ size, cc. 83, 141, 174

„ „ not to be used stale, pp. 207, 208, 212

„ „ on canvas, c. 165

„ „ over gilding and silvering, cc. 141, 143, 144

„ „ preparation of, pp. 196, 211

„ „ the tempera for panel-painting, cc. 52, 54,
56, 57, 60, 72, 145, 147, 218

„ „ *versus* egg-oil, p. 213

„ „ water added to, pp. 195, 198, 207, 211

Embroidery designs, cc. 164, 166

Eraclius, pp. xxvi, xxvii, xxix, xxx, 222

FIG-MILK, with egg tempera, cc. 72, 90; pp. 184, 211, 212

Fig-wood, c. 6

Filarete, p. 227

Fish-glue, pp. xxi, xxiv, xxix, xxxiv

„ „ uses of, cc. 16, 25, 108; p. 236

Flesh-painting, in *Schedula*, p. xxviii; in *Schedula* and
Hermeneia compared, pp. xxxiv-xxxviii;
in St. Audemar, p. xxx; in Strasburg
MS., p. 226

„ „ in fresco, cc. 67, 68; pp. 201, 219

„ „ in oil, c. 93

„ „ in tempera, cc. 147, 148; p. 202

Flour for grounds, p. 238

„ for paste, c. 105

„ for reliefs, c. 129

Fresco-painting, ancient, pp. xix, xx, 215; in *Schedula*,
p. xxviii; in Lucca MS., pp. xxiv, xxv;
in *Hermeneia*, pp. 216, 217

„ „ method of, cc. 4, 67-69, 71, 72, 104;
pp. 213-219. *See also* Drapery

„ „ pigments for, cc. 38-40, 42, 44-46, 51,
57, 58, 60, 61; pp. 247, 251, 256

„ „ system of chiaroscuro in, p. 201

GADDI, Agnolo, pp. x, xi; cc. 1, 67

„ Taddeo, p. x; cc. 1, 67

Garlic for mordants, cc. 153, 165

„ to make tempera lie on oil, p. 213

Gesso, burnt gypsum, *i.e.* plaster of Paris (*see* p. 233),
pp. xxiv, xxix, xxxiii; cc. 4, 6, 110, 184; pp.
229-233; specifically called gesso grosso

„ used for casting, cc. 185-187; pp. 232-238

„ „ for grounds, cc. 115, 117

„ „ for relief work, cc. 128, 169, 170; stiffened
with tow, c. 170

„ with egg-yolk and size over stone figures, c. 174

Gesso sottile, *i.e.* slaked plaster of Paris, necessity of
mixing it with size, pp. 233, 235

„ „ preparation of, p. xxxiii; c. 116; p. 233

„ „ used for casting small objects, c. 187

„ „ „ for delicate relief work, cc. 124, 125,
169, 174

„ „ „ for gilding on parchment, cc. 157, 158

„ „ „ for grounds for gilding and painting,
cc. 116-121

Giallorino, *see* Naples yellow

Gilded glass, etching on, c. 171

Gilder's-cushion, c. 134

Gilding, in Pliny, p. xxi; in *Podlinnik*, p. xxi; in Papyrus, p. xxii; in Lucca MS., pp. xxiii, xxiv; in *Schedula*, p. xxix; in *Hermeneia*, p. xxxiii

„ cc. 4, 37; with terra-verde, cc. 51, 104, 111, 116

„ a stone figure, c. 174

„ burnishing of, cc. 124, 134, 137, 138, 140, 141, 143, 162, 168; p. 240

„ fine quality in, pp. 239, 240

„ imitation, c. 159

„ on parchment, cc. 157, 158; p. 241

„ on walls, cc. 95-103

„ process of with white of egg for panels, &c., cc. 123, 131-140

„ stamping and engraving of, cc. 4, 104, 140, 142, 143; p. 191

„ with mordants, cc. 139, 151-153

„ „ „ on canvas, cc. 162, 165, 166

„ without burnishing, p. 241

Gilt paper, c. 168

Giotto, pp. ix, x, xi, xv, xvi, xviii; cc. 1, 67, 185

Glaire, *see* Egg-vehicles, White of Egg

Glass cement, c. 107

„ gems, c. 124, 143

„ painting on, c. 94, 103, 171

„ used in grinding orpiment, c. 47

Glory (diadem, nimbus), cc. 98, 101, 102, 140

„ on canvas, cc. 162, 165

Glue, p. xx

„ bull-glue, pp. xxiv, xxxiii, 234

„ cheese-glue, c. 112. *See also* Fish-glue, Size

- Gold, alloyed, cc. 95, 151, 160; fine, cc. 95, 96, 98-101, 143, 151, 160; pp. 241, 242; ground, c. 160
 „ background, cc. 138, 139, 140-143, 160; p. 239
 „ „ painting on, pp. 199, 243
 „ drapery, cc. 141-143
 „ leaf and beating, cc. 134, 139; pp. 241-243
 „ size, c. 99
 „ writing, cc. 157-160
 Greek green, *see* Verdigris
 „ tradition in technique, pp. x, xv, xviii, xxvi, xxvii, xxxv
 Grinding colours, cc. 4, 35, 36, 42, 47, 52, 59, 62, 93, 104
 Grounds, cc. 4, 104
 „ damp-proof for stone, c. 174
 „ „ for gilding on parchment, cc. 157, 158
 „ Egyptian, p. 229; in Pliny, pp. xxi, 232; in Lucca MS., p. xxiv; in *Schedula*, pp. xxviii, xxix; in *Hermeneia*, p. xxxiii
 „ of lead pigments and oil, pp. xxv, 222, 223
 „ of wood-ashes, c. 170
 „ practical directions—
 for canvas, cc. 162-165; pp. 235, 237, 238
 for panels, cc. 109, 110, 113-121; pp. 234, 235
 Gypsum, *see* Gesso

HAIR-PAINTING, cc. 69, 148

Hatching, pp. 204, 219

Hermeneia, pp. xvii, xxv, xxvii, xxx, xxxi-xxxiv, 216, 217, 237, 256

Honey, mentioned in early English accounts, p. 185

Honey, used in a secco method, c. 177

„ uses of, cc. 185, 187; pp. 236, 237, 241

ICHTHYOCOLLA, pp. xxi, xxiv, xxix. *See also* Fish-glue

Icon, p. xvii

Indigo, cc. 19, 47, 53, 61, 74, 75, 83, 144, 163, 173

pp. 254, 256, 258

KERMES lake, c. 62; pp. 252, 253

LACQUER, pp. 241, 264

Lake, cc. 44, 62, 72, 73, 76, 79, 83, 141, 142, 145, 149,
159, 172; p. 252

Lamp-black, c. 37; for printing on cloth, c. 173; p. 245

Lapis-lazuli, p. xix; c. 62; p. 257

Laurentiana MS., Preface; p. 140 (note)

Leather in decoration, c. 169

Leucas, p. xxi

Leucophoron, pp. xxi, 232

Leyden Papyrus, pp. xxii, xxiii, xxvi

Liber Illuministarius, p. 232

Lime, a basis to pigments, c. 161

„ a drier for oil, p. 222

„ intonaco, pp. xix, xx, xxviii; cc. 67, 90, 102, 126,
127, 144; pp. 215 *et seqq.*

„ white, *see* Bianco Sangiovanni

Linen in grounds, p. xxiv; cc. 4, 114, 133, 170; pp. 229-231

„ printing patterns on, c. 173

„ stretched, *see* Canvas

Lucanus, p. 220

Lucca MS., pp. xxiii, xxv, xxvi, xxxiv, 221, 232, 242, 245,
248, 256

Lye, *see* Potash lye

MADDER, pp. 245, 252, 258

Mappæ Clavicula, p. xxvi

Marciana MS., p. 207

Massicot, pp. xxxvi, 254

Mastic, p. xxxiv; cc. 56, 62; pp. 262, 263

Mead, as a vehicle, p. 184

Milanese stucco, p. xxxi

Milk, as a vehicle, p. 217

Minever (vaio, or grey squirrel) brushes, c. 64

„ tails, how to preserve, c. 66

Miniature painting, cc. 154, 157, 159; pp. 184, 187, 196,
207-209, 236, 241, 250

„ „ pigments only suitable for, cc. 43, 49,
50, 56, 161

Minium, meaning red lead, pp. xxix, xxxvi; cc. 40, 41, 72,
141, 173; pp. 247, 248, 250

„ meaning vermilion, p. xxviii

Montpelier MS., p. xxvi

Mordants, gilding with, cc. 103, 104, 139, 143, 163, 165-
167

„ preparation of, cc. 91, 92, 151-153

Mosaic of crushed egg-shells on reliquaries, c. 172

NAPLES yellow (giallorino), cc. 36, 45, 46, 50, 52, 72, 78,
79, 86, 144; p. 254

Norwich pictures, p. 224

- OCHRE, red, pp. xxi, xxxvi, xxxvii ; cc. 22, 168 ; p. 245
 „ yellow, pp. xix, xxi ; cc. 45, 67, 72, 80 ; pp. 199, 253
- Oil, as a cure for damp walls, c. 175
 „ boiled, as varnish in *Podlinnik*, p. xxxv
 „ in combination with wax, pp. xxi, 249
 „ in gilding-ground in *Hermeneia*, p. 236
 „ injuring the gesso ground of a panel, c. 175
 „ linseed, cc. 24, 37, 91, 92
 „ of cloves, as an antiseptic, p. 211
 „ of eggs, pp. 210, 211 ; how to extract, p. 213 ; dissolves
 amber, p. 213
 „ olive, c. 25
 „ preparation of, cc. 25, 26, 91, 92, 98 ; pp. 221, 222, 227
- Oil-painting, pp. xxix, xxx, xxxiv ; cc. 89, 90, 93-95
 „ „ confused with tempera, p. 183
 „ „ historical sketch of, pp. 220-227
 „ „ occasional use of, cc. 143, 144, 150, 168, 179
 „ „ on glass, cc. 171, 172
- Ormolu, p. 241
- Orpiment, p. xxx ; cc. 47, 53, 55, 72, 144, 177 ; p. 255
 „ red (realgar), c. 48 ; p. 207, 255
- Ottoboniense* MS. of *Trattato*, see Vatican MS.
- PACHECO, on tempera technique, pp. xxii, 204, 207
- Panels, or wood for painting on, pp. xxi, xxiv, xxv, xxix ;
 cc. 4, 113 ; p. 228
 „ battening of, p. 229
 „ method of painting on, cc. 46, 103, 105, 122, 123,
 141-144, and esp. 145-
 150 ; also in oil, c. 89.
 referred to, cc. 162, 169,
 172

- Panels, ornamental frames surrounding, allusions to, cc.
 113, 114, 117, 119, 121, 124, 134
 pigments chiefly suitable for, cc. 40, 41, 44, 47, 48,
 54-57, 59-62
 „ preparation of, before grounding, c. 113; pp. 228-
 231
 „ priming and ornamenting of, cc. 109-125. *See*
 Grounds and Gilding
 „ protection afforded by, p. 237
 „ the tempera for, cc. 72, 145, 147; p. 183. *See also*
 Tempera
- Panselinos, pp. xxxi, xxxii, xxxiv, xxxvii
- Paper, how to paste it together, c. 105
 „ to draw on, cc. 10, 12, 13
 „ „ „ tinted, cc. 15, 16, 18-22, 32
 „ transparent, cc. 23, 25, 26
- Parchment, for transfer patterns, c. 141
 „ glue for, cc. 105, 108
 „ glue or size made from, cc. 110, 111, 113;
 p. 234
 „ laid over panels to paint on, pp. 230, 231
 „ tinted, cc. 15, 16, 17
 „ to draw on, cc. 10, 11
 „ transparent, for tracing, cc. 23, 24
 „ used in miniature painting, cc. 43, 154, 157-
 161
- Pens, c. 14
 „ pen and ink drawing, cc. 13, 23, 122, 164, 166
 „ pen outlines in miniatures, c. 157
- Pezzuole, *see* Clothlet colours
- Pisan pictures, pp. xxv, xxxiv
- Pitch, cc. 128, 130, 176
- Plaster of Paris, *see* Gesso

Pliny, pp. xix, xx, xxii, xxiv, xxv, xxix, xxxi, xxxiii, 217, 220,
228, 232, 245, 252, 253, 255-257

Podlinnik, pp. xxi, xxxii, xxxv

Porphyry slab, cc. 16, 25, 36, 42, 62, 132, 136, 160

„ synonym of sinopia, c. 38

Porporina (imitation gold), c. 159

Portfolio, c. 29

Potash lye, pp. xxx, xxxiv; cc. 49-62, 161, 173

Precious stones, c. 143 (imitation), c. 124

Proportions in drawing, cc. 30, 70

Purple colours (bisso, morella, pagonazzo), cc. 18, 42, 73,
74, 78, 145, 146

Purpurisum, p. 256

QUICKSILVER in imitation gilding, c. 159

REALGAR, *see* Orpiment (red)

Relief working, cc. 4, 104-109, 116, 125, 131

„ „ in gesso, and in tin, cc. 143, 169, 187

„ „ on walls, cc. 126-130

Reliefs, varnishing of, cc. 156, 169

Resin, p. xxi; cc. 62, 151

Riccardiana MS. of the *Trattato*, Preface, pp. xii, 116
(note)

Rosetta (stamping tool), c. 142

Russian painting methods, pp. xxi, xxxii, xxxv

„ pictures, p. xvii

SAFFRON (crocus), p. xxiii; cc. 49, 173; pp. 217, 255

Sainte Chapelle, p. xxv

Sanguigno, c. 148

Schedula, pp. xxvi, xxvii, xxix, xxx, xxxiv, xxxv, 184, 221,
222, 230, 234, 247, 256

Schlettstadt copy of Lucca MS., p. xxvi

Secco-painting, general directions for, cc. 72, 95, 126, 146,
150; pp. 183, 184, 217

„ „ draperies in, cc. 72, 73, 75, 77, 79, 80-84

„ „ pigments for, on walls, cc. 38, 44, 51-54,
60, 62, 72

„ „ special method with terra-verde, c. 177

„ „ tempera on panels called secco, p. 218

See also Fresco

Shields, decoration of, c. 144

Siena, cc. 60, 67; p. 231

Size or glue, *see* p. 234

„ flexibility of, p. 236

„ in Egyptian remains, pp. 229, 230, 257

„ mentioned in early English accounts, p. 185

„ mixed with egg. *See* Egg-vehicles

„ not to be used stale, pp. 214, 235

„ preparation of, cc. 109, 110, 111; p. 234

„ used as a mordant in modern gilding, p. 241

„ „ a tempera, pp. xx, xxxiv; alluded to by Vasari,
p. 185

„ „ „ „ for certain pigments, cc. 49, 53, 55,
56, 60, 61, 83, 111, 140, 143,
144, 163, 177; pp. 199, 227,
259

„ „ „ „ in tinting drawing-paper, cc. 16,
18-22

„ „ „ „ rules for using, p. 214

„ „ in gesso for relief-work and casting, cc. 125, 128,
170, 187

- Size used in grounds, pp. xxi, xxiv, xxix, xxxiii; cc. 110, 111, 113, 115, 117, 119, 162, 163, 168, 170; pp. 228-238
- „ „ in same picture as egg, c. 141; pp. 199, 214
- „ „ over gilding, p. 241
- „ „ to prepare canvas for grounding, cc. 162, 165; p. 238
- „ „ „ „ leather for grounding, c. 169
- „ „ „ „ panels „ „ cc. 113, 114, 118, 170
- „ „ „ „ stone „ „ cc. 94, 174
- „ „ „ „ walls for oil-painting, c. 90
- „ „ under varnish, cc. 111, 178
- Silvering, cc. 95, 142, 143
- Sinopia, p. xxi; cc. 38, 45; pp. 245, 251
- „ uses of, cc. 21, 39, 67, 72, 80, 82, 83, 147
- Sloane MS., pp. xxix, 223
- Soap in grounds, p. 237
- Sponge, cc. 72, 90, 131, 155, 174, 177
- Starch in grounds, c. 162
- Stoglaſſ*, a Russian painting guide, p. xxxii
- Stone, cement for, c. 106
- „ gilding on, c. 174
- „ painting on, cc. 89, 94
- Strasburg MS., pp. xxxv, 209, 225
- Style, for drawing, cc. 8, 10-12, 30, 142, 172
- „ method of drawing with, c. 8
- Sugar in grounds, cc. 158, 162-165; pp. 236, 237, 241
- Sulphur for impressions of medals, c. 188
- „ in egg, pp. 212, 254
- „ in porporina, c. 159
- „ in vermilion, pp. 247-249

TABLETS for drawing, cc. 5, 6, 104

Tallow in gilding, p. xxxiii

Technical traditions, pp. xxvi, xxvii, xxix, xxxiv, 184

Tempera or yolk-of-egg painting, pp. 183, 195, 198, 218

„ advantages of, pp. 213, 214

„ ancient, p. xxii

„ as under-painting to oil, pp. 209, 213, 236, 238

„ called *a putrido*, p. 207

„ chemistry of, pp. 210 *et seqq.*

„ comparison of with oil-painting, pp. 188, 189,
204, 205, 210, 223, 224

„ „ „ with fresco, p. 217

„ early English, pp. 184, 223, 224

„ grounds for, *see* Canvas, Panel

„ ideals of, and Ruskin's description of them,
pp. 191, 192

„ permanence of, pp. 206, 210

„ qualities of, pp. 185, 186, 188, 190, 191, 194,
203, 204, 218, 224

„ skies in, Ruskin's description of, p. 193

„ system of chiaroscuro in, pp. 200, 202, 203

„ technique and stages of a picture in, pp. 218, 219

„ washing of, pp. 186, 264. *See also* Drapery,
Panels, method of painting on

Terra-verde, cc. 16, 20, 51, 57, 72, 77, 86, 150; p. 255

„ „ as a shade or ground colour, cc. 67, 87, 147,
148; p. 202

„ „ for a gilding ground, cc. 51, 133

Theophilus, *see* *Schedula*

Theophrastus, pp. xix, 232

Tin, gilt, used on walls, cc. 95-97, 99, 143

„ reliefs, cc. 128, 159, 170

„ used instead of silver, c. 95

Tortoise-bile, p. xxiii

Transfer patterns, cc. 4, 105, 141, 142

Trattato (of Cennino), Preface, pp. ix, xii, xiii, xv *et seqq.*
232, 233, 240

ULTRAMARINE, cc. 36, 55, 72, 73, 75, 77, 83, 141, 143,
145, 146, 172; pp. 224, 257

Umber, p. xxxviii

Urine, grinding lake in, c. 44

VARNISH, pp. xxiv, xxix, xxx

„ as a remedy for damp walls, c. 176

„ as a vehicle, c. 179; pp. 191, 209, 225

„ „ „ in colour-printing, c. 173

„ in mordants, cc. 91, 151

„ should not be mixed with tempera, p. 186

„ Cennino's, p. 262

„ Van Eyck's, pp. 225, 256

See also cc. 97, 99, 101, 107, 129

Varnish painting, pp. 191, 209, 256

Varnishing, cc. 4, 111, 153, 154, 155, 165, 169, 170, 174,
177, 178

„ over gold, cc. 162, 165; p. 262

Vasari, notice of Cennino, pp. xiii, xiv

„ „ of tempera-painting, cc. 183, 185, 188-190

„ allusions to pigments, pp. 245, 255, 258

Vatican MS. of the *Trattato*, Preface, p. xii; called Otto-
bonian, p. 140 (note)

Vehicles, *see* Beer, Bran-water, Egg-vehicles, Whole egg, Yolk
of egg, White of egg, Fig-milk, Fish-glue, Gum, and Gum
Arabic, Mead, Milk, Oil, Size, Varnish, Wax, Wine

Velvet, painting on, c. 165

- Venice turpentine, pp. 256, 262, 263
 Verdaccio, cc. 67-69, 85-87, 90, 147, 148, 150
 Verde-azzurro, *see* Verditer
 Verderame, or verdigris, cc. 49, 56, 72, 98, 143, 150-152,
 172, 173; p. 256
 Verde-terra, *see* Terra-verde
 Verditer, cc. 52, 86, 150; p. 256
 ,, blue, *see* Azzurro della magna
 Vermiculum, p. 251
 Vermilion, *see* Cinnabar
 Verzino, *see* Brazil-wood
 Vessels to contain colours, cc. 36, 67, 93
 ,, to keep brushes in oil, c. 93
 Vinegar used in miniature painting, p. 184
 ,, ,, with egg-vehicles, pp. 207-211
 ,, ,, with verdigris, c. 56
 Vitruvius, pp. xix, xx, xxii, 220
 Volterrano, c. 115, 184. *See also* Gesso

- WALLS, gold adornments and reliefs on, cc. 95-103
 ,, painting on, pp. xix, xx, xxviii; cc. 4, 67 *et seqq.*
 ,, ,, in oil, cc. 89-91, 144, 148, 150
 ,, to cure damp in, cc. 175, 176
 Water-colour drawing, cc. 10, 13, 31, 32, 122, 161, 162
 Wax, in fresco, pp. xx, 220
 ,, in other painting, pp. xx, xxi, xxiv, xxv, xxviii, xxxi,
 230
 ,, polish or varnish, pp. xxi, xxv, xxx, xxxi, xxxiv
 ,, reliefs and casts, cc. 130, 187, 188
 ,, saponified, as a vehicle, pp. xx, xxx, xxxi
 ,, other uses of, cc. 62, 106
 Westminster painting, pp. 185, 222-224, 231, 242

White lead, or biacca, pp. xxviii, xxxiv, xxxvii; cc. 6, 16,
18, 19, 20-22, 31, 32, 59, 72, 107, 141, 145, 151, 158;
p. 256

Whitening, *see* Chalk

Wilton triptych, p. 185

Wine, as a vehicle, pp. xxx, 184, 185

„ in gilding, c. 153

YELLOW ochre, *see* Ochre

ZINC white, p. 256

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